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Popular Woodworking

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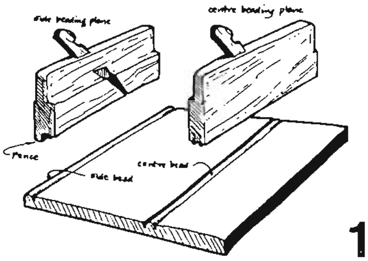
On the Cover

Dovetail joinery is involved in many articles in this issue, including the traditional "Joiner's Toolbox" project shown here. That article starts on page 31, but if cutting this joint is new to you, we'll tell you how to go about it, starting on page 20.



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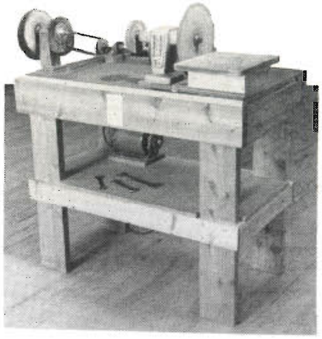

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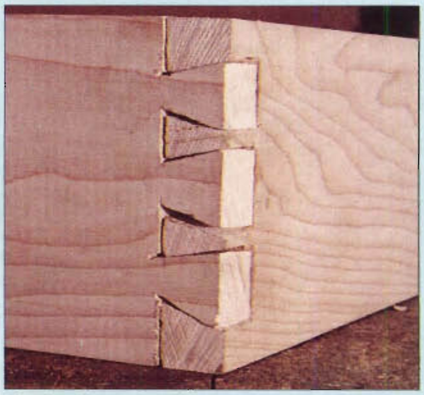
Clear Cuts

If cutting dovetails comes easy to you, then we've got some real treats for you in this issue. If it doesn't, stick around awhile; we'll have you dovetailing in no time.

In fact, for those of you who have never cut dovetails, let me start off by sharing a secret with you: until a few months ago, I hadn't either. I've always gotten by just fine without trying to fit together strange wedge-shaped fingers to make a box. Rabbets had always been my joint-of-choice for drawers and carcases; they were easy and adequate. Dovetails were for artists and pros.


Cutting dovetails takes practice, even if you're the editor of a woodworking magazine.

But when I saw the design for Joe Petrovich's "Joiner's Toolbox" (page 31), I decided the time had come for me to learn this joint so I could make a similar toolbox for myself.

With this recent education in mind, I want to let you in on The Great Truth that will help you as you learn to cut dovetails: your first attempts *will fail*. You'll have huge gaps in the joints, you will have pins that don't line up with sockets and you will have chipped out pieces in areas that show.

How can I be so sure, and why am I telling you this? I am sure because *everybody's* first dovetails were lousy; even James Krenov's first dovetails looked nothing like the crisp tight ones he cuts now. I'm telling you this so you won't be surprised when yours don't look like Krenov's.

Read through "Cutting Dovetails" on page 20, and try it on a couple of pieces of scrap wood. Then trim off your first attempt, and try it again. You'll get the hang of it. When you do, tackle one of the projects in this issue.

The photo above shows my first efforts at dovetailing; yours can't be any worse. My later results and my half-finished tool box can be seen on the front cover.

Hugh Foster, the author of our article on cutting this joint, pointed out something to me that I think is absolutely true. He said that as you learn to dovetail, you are likely to pick up habits of care and precision that will appear in other aspects of your work, leaving you with a better product even when you don't use dovetail joints.

David M. Camp

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Popular Woodworking (ISSN 0884-8823) is published bimonthly by EGW Publishing Co., 1300 Galaxy Way, Concord, CA 94520. Second-class postage paid at Concord, California and additional mailing offices. POSTMASTER send address changes to *Popular Woodworking*, 1300 Galaxy Way, Concord, California 94520.

SUBSCRIPTIONS:
A year's subscription is $15.00; two years' worth is $28.00; outside of U.S.A. add $5.00/year. Send all subscriptions and correspondence to:

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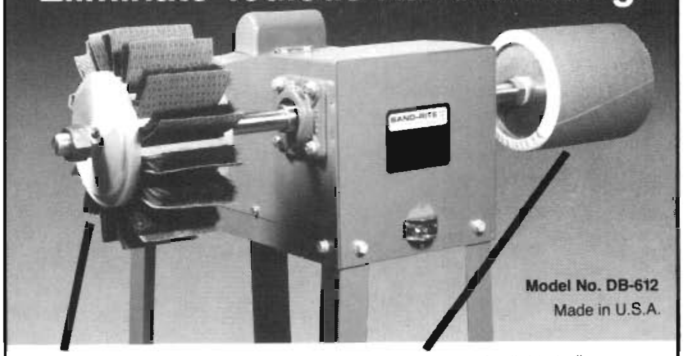

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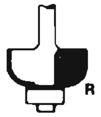		COVE				
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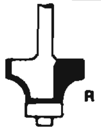		ROUND OVER				
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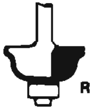
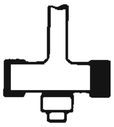
		ROMAN OGEE				
	#07	5/32" R	5/32"	1¼"	15/32"	18.00
	#08	1/4" R	1/4"	1½"	3/4"	20.00
	#11	3/8" RABBETING	Deep 3/8"	1¼"	1/2"	14.00
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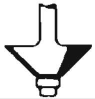
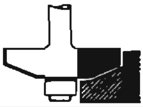
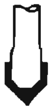
	#12	45° CHAMFER	45° Angle	1½"	5/8"	15.00
	#15	RAISED PANEL	20° Angle	1-5/8"	1/2"	25.00
	#35	1/4" V Groove 90°		1/4"	1/4"	8.00
	#36	3/8" V Groove 90°		3/8"	3/8"	9.00
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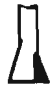	#16	3/8" Dovetail 9°		3/8"	3/8"	7.50
	#17	1/2" Dovetail 14°		1/2"	1/2"	8.50
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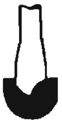		CORE BOX (ROUND NOSE)				
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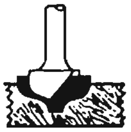		GROOVE FORMING OGEE				
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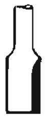	#24	1/4" Straight Bit		1/4"	3/4"	7.00
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You Get What You Pay For

I am writing to offer another viewpoint with regard to your editorial in the June/July 1987 issue.

I have a set of portable electric tools I bought some 25 years ago that I still use. I paid between $30 and $45 for each of them which was typical of medium-quality consumer tools at that time.

A recent Sears ad showed similar tools on sale for $34.99. But how can this be? Looking at things in perspective, how can stores continue to sell tools at the same price for 25 years when inflation has caused salaries, the cost of cars, homes, and groceries to go up by a factor of four times and more?

This question gets to the very heart of why tools being made today aren't comparable to something made decades ago. We consumers demand not only low-cost tools, but we also want the bells and whistles. The manufacturers oblige, but to keep costs down while providing features like variable speed and reverse, something had to go out the window. So in this sense, you're right. Some might think of the manufacturers as deliberately making shoddy tools: I think of it more as a trade-off.

On the other hand, most manufacturers make several lines of tools, each with different levels of quality, so if a person wants a good tool, it's still there to be had. One catalog I have shows the price of consumer-oriented 3/8" drills ranging from about $25 to $100. Their line of industrial quality 3/8" drills ranges from $80 to $160. Like they say, you get what you pay for.

If someone buys a flea-powered $25 drill on sale for $18.88 and it burns out because it was put to hard use, is it really fair to say that quality tools are no longer being made? Frankly, I'm surprised that the products work as well as they do.

I'm sure that tools can still be made with metal castings rather than plastic. I'll bet that they can even make tools that can be repaired. But would you be willing to pay for it? I think all too often, tool purchase is influenced more by price rather than whether the tool will be adequate for the job it will be expected to do. I bought a Mark V Shopsmith 25 years ago for $400. A new one lists for $1,400. If this price increase is typical of what it might cost to make things as they were back then, my $30 drill would now cost $140. I don't know about you, but I'll stick with my cordless drill/driver I bought on sale last year for about $100 any day. My 25 year-old drill? Most times, it's out to pasture for a well deserved rest.

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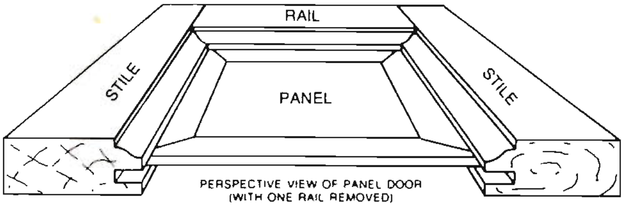

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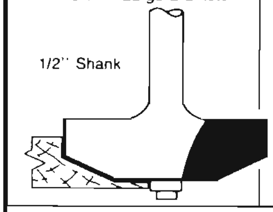

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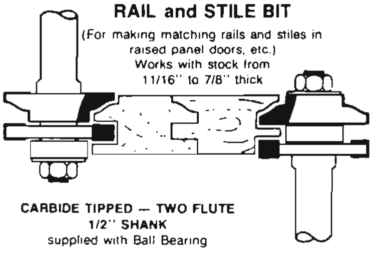

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Your point is well said and well taken. Perhaps a more legitimate complaint would be for me to say that it's a shame that the same consumer attitude that makes us balk at paying such high prices for quality tools, makes furniture and craft consumers balk at giving us a price that would allow us to afford *the better tools.*

Editor

When is it "Coming Up?"

In your April/May 1987 issue, in the section titled "Coming up in PW, A Sampling of Future Articles," you advertised a Connecticut River Valley Desk on Frame. I cannot tell you how excited I became when I saw this. I had been looking for a desk to build and this really struck my fancy. I waited patiently for your June/July issue to come out. I checked each week at the magazine store. I even went so far as to sell my current roll top desk in order to make room for the new Connecticut River Valley Desk on Frame which I was going to soon have. I planned to start the project as soon as the June/July issue broke.

When I found out your new issue had been published, I rushed down to the magazine store and bought it right away. I was very angry and quite let down to find out that the desk was not in the new issue. I have already purchased the oak and drawer stock needed to complete this project. I am geared up, ready, willing and able to go, except I have no plans.

F.A. Rachal Jr.
Moaringsport, LA

For as long as I've worked here, I've wanted to be able to tell readers about upcoming articles so that they know what to expect and have something to look forward to. Unfortunately, with our small staff and our current production schedule, we aren't able to work far enough ahead to positively know what's going to be in the next issue when we finish the one we're working on. Sometimes there just isn't room for everything we plan to include in an issue, and so an article has to be postponed.

So when I saw that another magazine was giving readers an idea of future articles without specifically stating that they were for the next issue, I stole the idea as a way out of my dilemma.

Now I find that this is misleading to readers, so I've decided to take out the "Coming Up" section until the day when I can be sure that we're talking about what's coming up in the next issue.

In the meantime, you'll find that the Connecticut River Valley desk made it into this issue. I hope you enjoy making the project, and that it was worth the wait.

Editor

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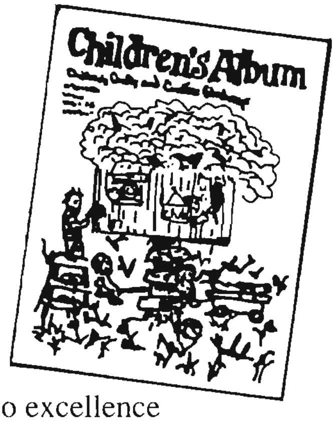

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Lathe Info Requested

I would like to make contact with anyone who may have information about a Hendey wood lathe made in Wolcottville, Connecticut many years ago. They made metal turning lathes, but I'd like to know if they made one for wood.

Marvin M. Dounty
4281 Fredericksberg Ave.
Columbus, OH 43228

Legal Hardware

I need to know where to purchase the hardware used on the sliding doors in the old style lawyer's bookcases. The hardware is a geared device that is installed in the side panels. The mechanism allows removal of the glass doors and provides a smooth operation for the doors to pull out and slide back into the cabinet.

Ron L. Herridge
6806 S. Locust Ct.
Englewood, CO 80112

The closest item I know of that sounds like what you describe is a flipper door slide from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374-9514. Any other suggestions, readers? *Editor*

Blade Visibility

We are all well aware of the danger of saw blades whirling away. They can virtually disappear from sight. I solved this problem by spraying all my blades with fluorescent red paint.

Now when ever my blades are spinning they show up as a sharp, bright image, a warning sign for danger. This allows for easier judgement and helps prevent nasty accidents.

Mark Adams
Edison, NJ

Home Made Countersink Bit

I've found that the commercially available "screw mate" type drill bits can be too short for use in some areas. When I wanted to drive a screw at an angle to lock chair legs to a seat, I made my own countersinking drill bit. I took a ⅜" spade bit and ground the profile so that it drills a hole that is different sizes for the threads, shank and head.

Robert Tupper
Canton, SD

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840494

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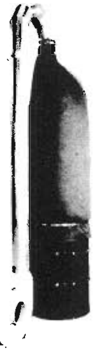

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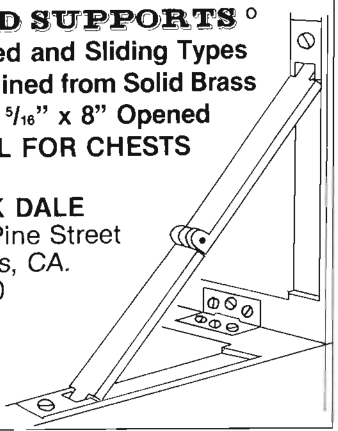

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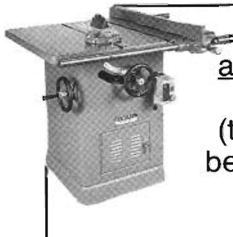

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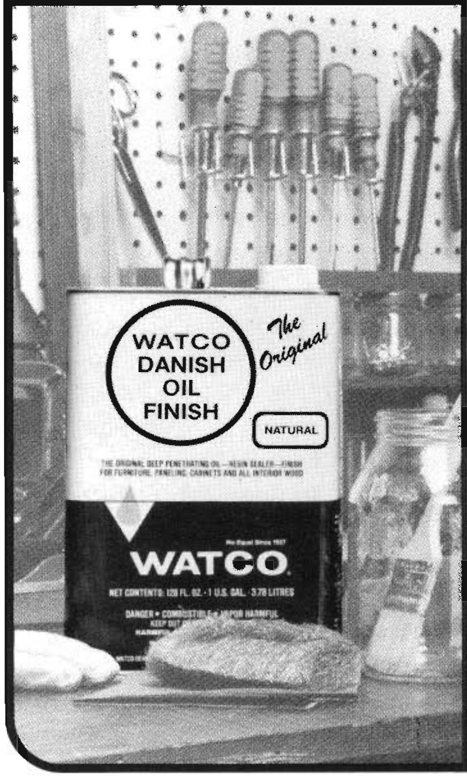

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Book Reviews

by Hugh Foster

Three from Watson

To celebrate the recent release of a paperback edition of 1984's *Furnituremaking Plain and Simple*, I've decided to review all three books by its acclaimed author, Aldren A. Watson. These titles, though not necessarily intended as a series, make up a very significant contribution to the body of literature on woodworking. In fact, if you buy *Country Furniture* as a hardback, the three volumes make a perfectly matched physical trilogy as well as a fine continuation of the work in question.

Country Furniture by Aldren A. Watson (Thomas Y. Crowell Company, 10 East 53rd St., New York, NY 10022, ©1974) 274 pp., hardback, $17.95. Also available as a "Plume" paperback from the New American Library, 120 Woodbine St., Bergenfield, NJ 07621, $4.95.

Country Furniture, the oldest and least expensive of the lot, is a history book as much as anything else. This book's interest in antique furniture is in what it tells us about the people who made, bought, and used it. Country furniture was furniture built by ordinary people of the Colonial and Revolutionary periods who lived in rural areas, as opposed to that furniture made in the seaport cities by "professional" cabinetmakers. Their work was certainly more than utilitarian. The history of the country furnituremakers' joinery dates to the pre-Christian era.

Native woods are described almost poetically as is the "pre-motorized" method of converting a tree into usable boards; plain and quarter sawing are made perfectly clear, and several "non-mechanical" methods of lumber drying are taught.

The plans and sketches of early woodworking shops demonstrate how little our modern conveniences have changed the shop. Indeed, when we want "real" precision, we work with hand tools at a bench that has changed little over the past several hundred years.

The chapter on "Bench Tools and Equipment" appears to be a significant prelude to *Hand Tools: Their Ways and Workings*; after we have learned what the tools do, we can advance to "Woodworking Methods. " After five pages of text, this chapter proceeds with nearly eighty pages of well-captioned illustrations that show right and wrong methods of making dovetails, blockfront drawers, shell carving, mortise and tenons, cornice scrolls, stop flutings, panel construction, window sash, lathe work, chair making, bentwork, and hardware-making and application. These pages are of practical as well as historical interest.

Indeed, this volume may satisfy — or it may whet your appetite for the next two volumes in the series. Watson's text is easy to read, often as entertaining as it is informative, and he has profusely illustrated each volume; the hundreds of drawings in *Country Furniture* are certainly as clear as photos would be, and since photos couldn't possibly have been taken in the colonial workshop, they provide a clearer focus to the author's purpose.

Hand Tools: Their Ways and Workings by Aldren A. Watson (W. W. Norton and Company, Inc., 500 Fifth Avenue, New York, NY 10110, ©1982) 416 pp., hardback, $29.95

Watson claims to work wood only with hand tools. Given his artistic ability, it may be that *Country Furniture*'s practical section on tool use led to the commission for *Hand Tools: Their Ways and Workings* which is less interesting as a "reading" book and far more useful as an encyclopedia of hand tools. In thirty-one chapters Watson treats the various classes of hand tools; some of the chapters are a short four pages, and others run to nearly seventy.

The longest chapter deals with planes. First Watson shows how to take a plane apart; then he goes on to detail how to sharpen and adjust planes for maximum service and ease of use. He explains why we might want extra irons for some of our planes: the cutting edge should have square corners for jointing work and rounded corners for smoothing surfaces. After making the plane as nearly perfect as it can be, we learn how to operate it properly; doubtless, Watson will exhort most of us to un-learn some of our bad habits. The chapter also discusses many of the operations that hand tool woodworkers do with planes. The chapter goes on to celebrate the uses of ten different kinds of planes, thus suggesting the proper operation of any undiscussed varieties.

Thirty other chapters *describe the* use and maintenance of other hand tools. Of course, the workbench is the most important tool in any shop, and Watson suggests that having the bench the right height for its user is the most important aspect in reducing fatigue in the shop. This data alone may be worth the price of the book - but there's lots more here.

After that first reading, I have referred back to this book countless times since its publication. Watson does a better job than the instruction manuals of telling us how to sharpen and use new and used hand tools. I regard *Hand Tools* as an invaluable reference work.

Furnituremaking Plain and Simple by Aldren A. Watson and Theodora Poulos (W. W. Norton and Company, Inc., 500 Fifth Avenue, New York, NY 10110, ©1984) 328 pp., hardback, $24.95. Also available as a "Plume" paperback from the New American Library, 120 Woodbine St., Bergenfield, NJ 07621, $9.95.

Furniture Making Plain and Simple is the third volume in Watson's trilogy.

Hugh Foster is an English-teaching woodworker in Manitowoc, Wisconsin.

In it he advises us to take our time, to set realistic goals, to practice, to carry out each operation as though it were the *only* operation in the project. While this attitude won't do much to increase the profitability of a professional shop, it will enhance the quality and enjoyment of amateur pieces, and it will improve the *skills* of both amateur and professional woodworker.

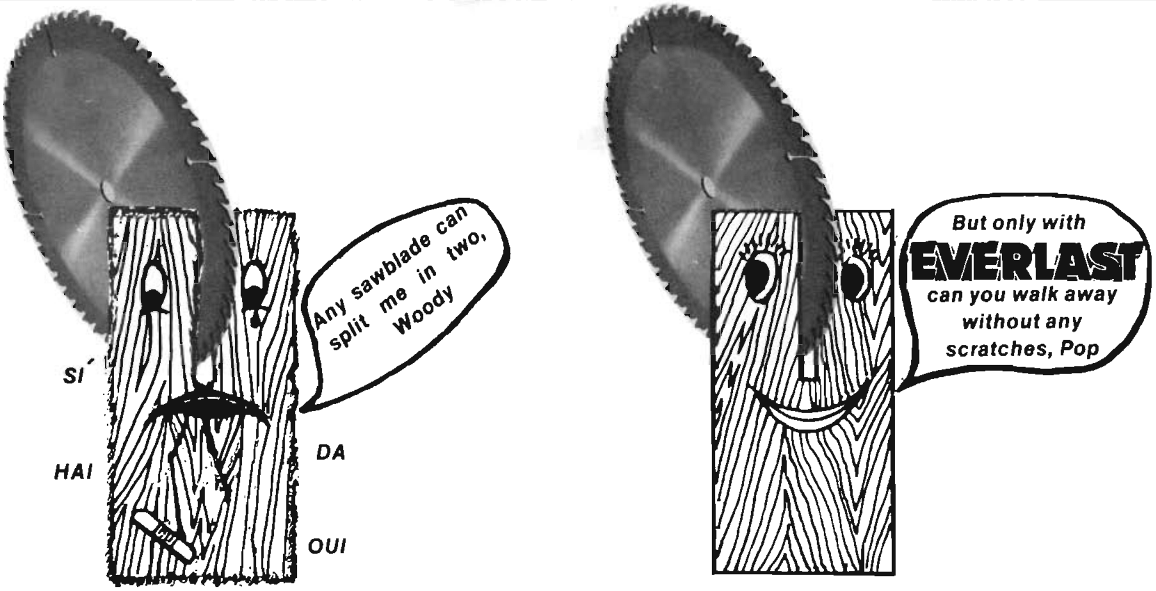
After advising us to get the best quality lumber, regardless of species, Watson covers good woodworking practice from layout to sanding. One of the most important tips he offers is to cut pieces as we need them and to always cut slightly oversize and then trim to finished measure. He advises that we make and use simple clampboards as substitutes for expensive commercial clamps.

An excellent chapter on making joints details the making of butt, dovetail, groove, housed, mitered, mortise and tenon, notch, rabbet, and tongue and groove joints.

Watson shows how to make "turned" legs without a lathe, as well as how to make tapered legs, both two and four sided. Drawer construction comes clear with his superbly captioned illustrations. So does hanging drawers. He even removes much of the mystery from competent finishing.

Nearly the first half of the book is taken up with a discussion of "how to's" that are integral to any (if not all) projects. The rest of the book treats eleven projects, various hutches, armoires, cupboards, dressers, tables, beds, and chests so clearly that these projects would be excellent for hand tool training classes. In fact, students might prefer these projects because they would then end up with genuinely useful projects that their families could enjoy for years, unlike the still-empty gun rack my brother and his compeers were required to build. Each of these projects in "Colonial" or "Early American" style can be built entirely with hand tools, though "powered" operations might hasten their completion. Watson's style of illustration takes the projects apart in such a way that insightful readers might apply the timeless techniques of design to problems that more nearly meet the "custom" situations caused by their living spaces.

Even if you have no interest in the specific projects in *Furniture Making Plain and Simple*, the book is worth your perusal for its clear illustration of the principles of joinery and in hopes that some of the joy Watson finds in his work will rub off. Overall, these books are easily as important as Krenov's now-classic trilogy. I doubt if either of these authors - as different from one another as day is from night - would be flattered by the comparison, yet the work of each is inspiring. **PW**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DEALER INQUIRIES INVITED

Videoscene

by Alan Marks

With video instruction, the viewer must constantly deal with the personality of the teacher in addition to the subject matter under consideration. Throughout the two tapes reviewed in this column, two distinctly different personalities create distinctly different learning atmospheres. Of the two, I gravitate toward Del Stubbs' more casual presentation, rather than Richard Raffan's organized outline, though of course it is unfair to compare the two since they deal with different aspects of turning.

Bowl Turning with Del Stubbs, ©1985 by Taunton Press, Box 355, Newtown, CT 06470. 120 minutes, $39.95.

Stubbs enjoys his work. He compares his woodturning experiences to the feeling of dancing to music. The coordination of movements vary according to the type of pass one takes with the tool, and one modifies the movement according to what the piece requires, almost like a conductor orchestrating a symphony. Powerful cuts induce a kind of joyful, carefree feeling in the turner, and the bowl responds by changing its shape with every rotation. Delicate moves result in subtle changes. Then, as Stubbs says, one periodically stops the lathe and looks at the wood and gets to see something never before revealed, the distinct beauty, pattern, and color of its inner being.

Stubbs welcomes production turning because it gives him a chance to repeat his movements, and thus refine and perfect the dance. He has been "dancing" as a professional for ten years or more in Chico, California.

I found both his enthusiasm and his pragmatic, laid-back approach to turning to my liking. He begins by recounting a general outline of what he intends to cover: tools, chucks and fixtures, grinding and sharpening tools, how to deal with green wood, and finally, design and subtlety of form.

Stubbs divides his tools into four categories: flat or scraping tools, deep cut tools, or "bowl" gouges (including a round-nosed variety called a ladyfinger), shallow gouges, and medium cut gouges. He demonstrates the use of all of these and I learned things about technique I should have known years ago — things impossible to learn from books, but which are quickly grasped when presented visually.

The lathe is one tool I do not have in my shop because I learned to distrust it after my patternmaker's apprenticeship. My tools would do unpredictable things and since I had had no instruction on how to use the lathe, that was par for the course. With some good solid instruction, such as found in this video tape, I could have been spared a lot of patchwork.

I really appreciated an ingenious foot operated clutch Stubbs demonstrated. The foot control mechanically removes the motor shaft pulley from contact with the belt and leaves the motor running. It saves time, since one's hands and concentration remain with the workpiece and it offers some possibility of controlling the speed of the piece as well. The stock can be stopped instantly — a good safety measure — and the ease of stopping and starting encourages the operator to check his work more frequently.

Another clever modification was boxing-in the space beneath the bed of the lathe and between the legs, and filling it with sand, in this case, about 300 pounds. The sand dampens vibration and, along with another innovation, add-on leg extensions, provides stability.

For me, the most instructive part of this tape was having Del Stubbs use and explain the use of his tools, how they are moved across the face of the material and how they are held for efficient and safe passes.

I found his demonstration on grinding and honing tools excellent. I learned about something I did not know existed, a carbide matrix grinding wheel dresser, which both flattens and smooths the surface of the wheel.

I enjoyed vicariously the considerable pleasure with which Stubbs turns wood. Turning green apple wood in particular, a new experience for him, conveyed an obvious thrill and he exhibited a certain exultation in being able to convert a piece of firewood into a bowl of beauty, conceivably a joy forever. It was gratifying to be able to review this tape and I recommend it without any reservations.

•

Turning Wood with Richard Raffan (projects and exercises from a book of the same name, reviewed in issue #33 — October/November 1986), ©1986 by Taunton Press, Box 355, Newtown, CT 06470. 117 minutes, $39.95.

This second offering by Taunton Press left me with mixed feelings. It is rigidly outlined and organized in distinct sections. The first section takes up sharpening tools, the second deals, in a somewhat scientific approach, with stance and movement in using turning tools for cylindrical work. Somehow the joy of woodturning itself gets relegated to a back seat. Next Raffan demonstrates two unimaginative exercises, a gouge exercise and a skew exercise. The objective of both is to turn a series of repetitive beads on a cylinder. Incidentally, the four types of tools Raffan distinguishes between are the gouge, the skew chisel, the scraper, and the parting tool. Next comes a series of four projects, a tool handle, a pull knob, a scoop, and a box. Finally there follows a section on facework, with particular instruction in stance and motion. Ultimately a breadboard and a bowl are produced to illustrate

---

Alan Marks is a cabinetmaker from Pacific Grove, California and a contributing editor to PW.

the technique.

I found it difficult to concentrate on this video. At first the contrast between Del Stubbs' laid-back attitude and the distant British accent and approach of Richard Raffan irritated me. Returning to it after a few days' break, I've reconsidered. The distance I detected occurs precisely because of the way it was taped. The producer/director recorded the commentary by Raffan *after the fact* and then mixed in the machine sounds recorded during the demonstrations. As a consequence, Raffan's immediate involvement as a teacher is nil. He might as well be narrating a slide show. This is the only tape of its ilk I have seen, and in my opinion, such an approach does not work.

On the slightly positive side, since the tape was meant to tie in with Raffan's book, page reference numbers are superimposed over the picture at intervals so the viewer can refer to the book for supplementary information, a clever device. Unfortunately, the information referred to in the book is of such a dry, technical nature that I found my engagement flagging on that front as well.

One saving grace: it was always possible to see the way in which he used his tools, though frequently I found Raffan's running commentary unclear. I believe his demonstrations have value, and judging by what I have read in the book, the book alone does not offer an adequate explanation of what he tries to illustrate in it. To sum up, I think the tape may be of use, but I believe the subject matter could have been better presented. PW

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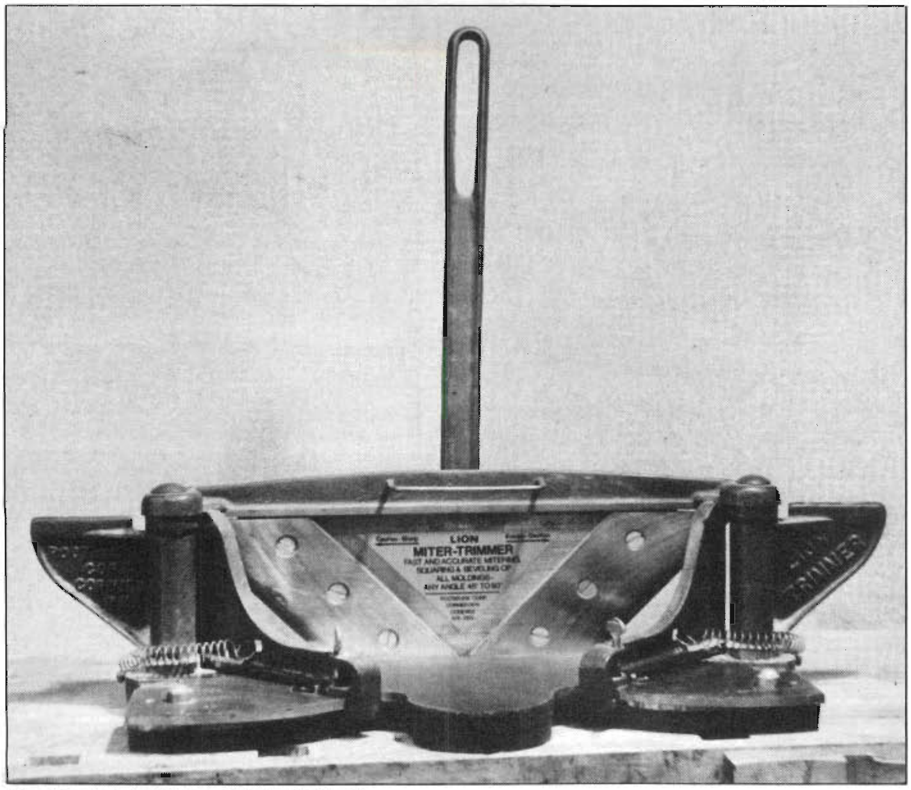
Tests & Comments

by Hugh Foster

Lion Miter Trimmer



The Lion miter trimmer slices wood with lever-operated knives, so it gives a cleaner cut than a saw blade.

From where I stand, the Lion Miter Trimmer from Pootatuck Corporation makes the standard miter box obsolete. It's accuracy is unmatched by a standard miter box plus it cuts miters, bevels, rounds, compound miters, square ends and chamfers.

The Lion Trimmer is a lever (rather than gravity) operated guillotine whose infeed table can be adjusted from somewhere just outside of square to somewhere just inside of 45° with positive stops at 45° and 90° on both cutting areas. This guillotine action provides a razor-smooth cut rather than the sawn cut from a standard miter box. Part of the reason for the tool's great accuracy is that its bed is a single massive casting, one of eight carefully machined, cast-iron pieces. It comes with honed razor-sharp knives ready to use. Its 90° and 45° stops have been carefully preset at the factory. Pootatuck's thorough instruction guides contribute to our ease in using their tools accurately, though the design is so "right" one can almost operate it intuitively.

The technique for its use is to cut the piece roughly to length at roughly whatever angle you want, and then to trim off a 64th or less at a time, until its fit is perfect.

I clamp the trimmer to my workbench when I need it, and store it out of the way the rest of the time. In a framing shop, or other shop where the tool is in constant use, it might be more advisable to screw or bolt the tool to the table to keep it from moving. This makes operating it accurately much easier. Though if you use it as a *trimmer* rather than as a *chopper*, the lever action is quite easy even without the clamping. I have, on occasion, chopped through some heavy stock that required all my strength and all my weight (between them considerable - even though I don't claim to be terribly strong), but that is not really the correct way to use this device.

My trimmer is now seven or eight years old and despite regular use, the tool has shown no special need for sharpening. When it does, I will leave that sharpening to the manufacturer. They charge only $16 for a regrind, including return shipping charges, and give one-day service by keeping the irons they are sent and mailing a sharpened, matched set from stock. And I'm sure they will do a better job of sharpening them than I am likely to do in my own shop.

Pootatuck also offers excellent attachments for its trimmer. When I bought my machine, a measuring attachment was available. It extended the cutting channels by nearly two and a half feet, and with a little judicious use of spring clamps, one could set a length for precise repeat operations. That attachment has changed little in price over the years. When I bought one recently, I was pleased to note that it now features a stop block that can be screwed into place, and one can use it to *walk* the piece being cut into the cutterhead in such minute measure that it is a real aid to achieving micrometer-like precision.

Apparently, good sales of the attachment have led to another very desirable change, this one in the trimmer itself. The measuring attachment is held in place with a couple of wing nuts on the main trimmer. Older models - like mine - require turning the trimmer on edge to apply the measuring attachment. The newer ones have threaded holes so the bolts to which the wing nuts attach the accessories are permanently screwed into place. I like that!

Another new accessory is the top-trimmer - it is the device one needs for cutting mouldings whose outside edges

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***Hugh Foster** is a woodworker from Manitowoc, Wisconsin.*

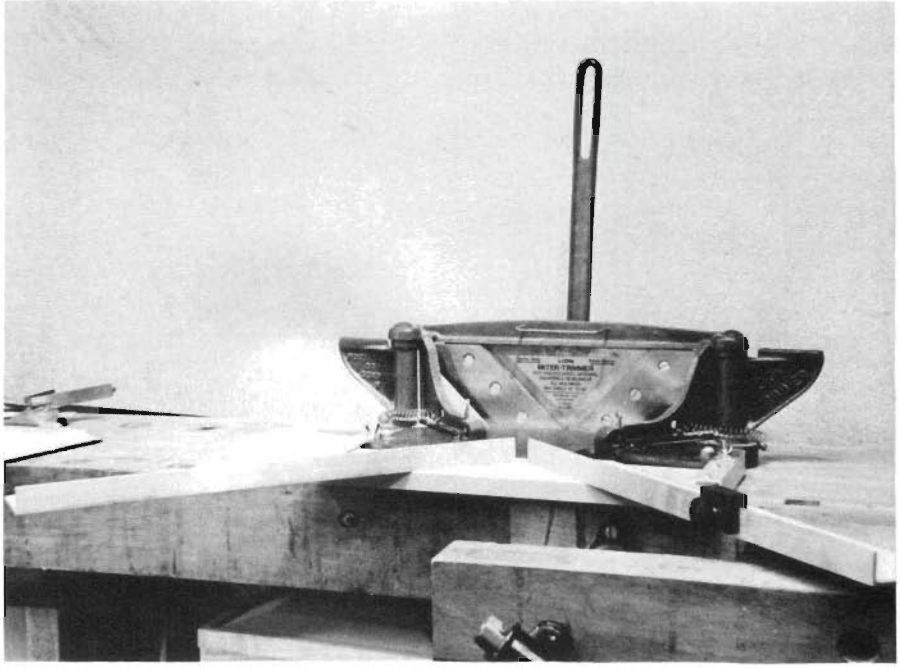
are tapered, hollow, or curved. The top trimmer clamps on the gauge when it is set at 90°, and it holds the moulding at 45° up from the bed; the moulding can then be cut with the blades first coming in from the top, not the side, with the bottom of the moulding pushing against the gauge, rather than the back of the moulding, as it would without this accessory. I also have a vision of using this jig to cut the compound miters to make a perfect-fitting parsons table, without some of the complexities that piece might otherwise require.

Interestingly, I have seen no degrade in the tool from one production run to the next. The Pootatuck people don't appear to be ready to cheapen their product to achieve any sort of false economy. (Would that some other manufacturers would follow their lead...) If anything, there have been some real improvements. This is one of precious few tools about which I can say I'd rather have a new one than a new copy of the 1920 model.

If these comments have not convinced you that a Lion Trimmer would be great in your shop, seek out someone who has one, sample it, and you will be convinced. Everyone I know who has one has probably "sold" at least one: I bought mine on the basis of a friend's, and when we brought mine to high school one evening for a project we were working on there, the head of the industrial arts department was so impressed that he ordered one for the school; that one has surely sold at least several others. If you're in the market for a precision miter box, be sure to sample the Lion Miter Trimmer.

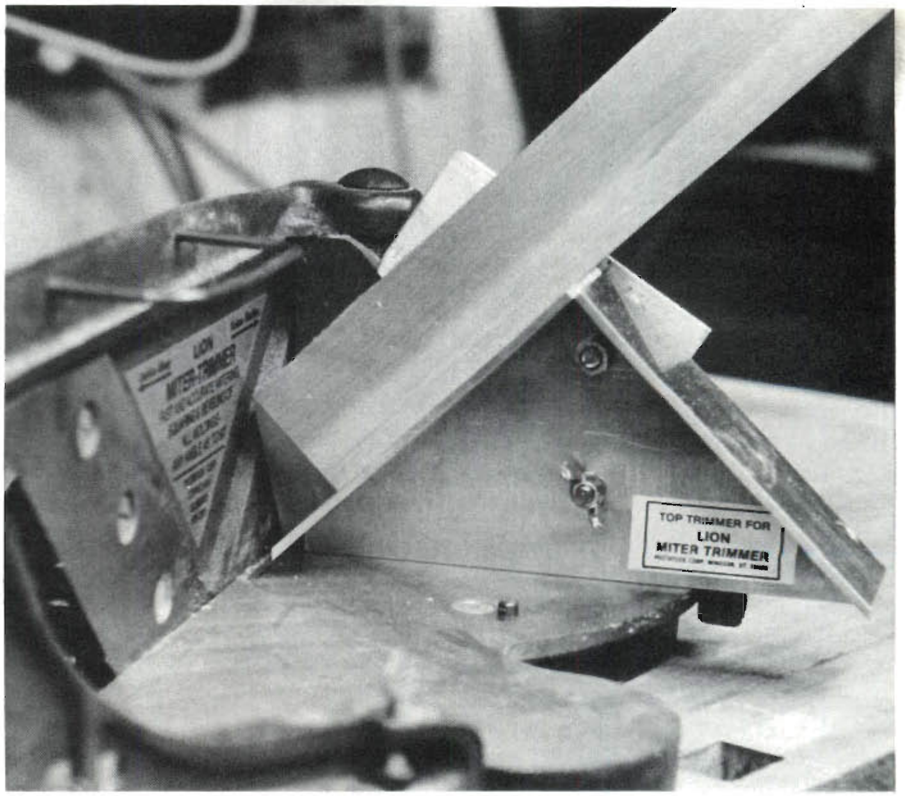
For More Information

Pootatuck Corporation
P.O.Box 24
Windsor, VT 05089



Two measuring attachments provide support for long workpieces and make it possible to use a stop-block for repeated cuts.

This top trimmer attachment makes it possible to cut moldings and compound angles.



Tried and True

by Graham Blackburn

Beading Planes

We've all seen those thin wooden planes with funny bottoms at flea markets and in antique stores that the "knowledgeable" storeowner or seller declares to be "a real old moulding plane, signed right here by the..." Most of us have probably thought "...mm, might look good on a shelf in the shop; though I can't imagine how those oldtimers ever used the thing..." The chances are that you would not only be surprised at how easy it is to use, but that you would find yourself actually using it and wondering how you ever got along without it.

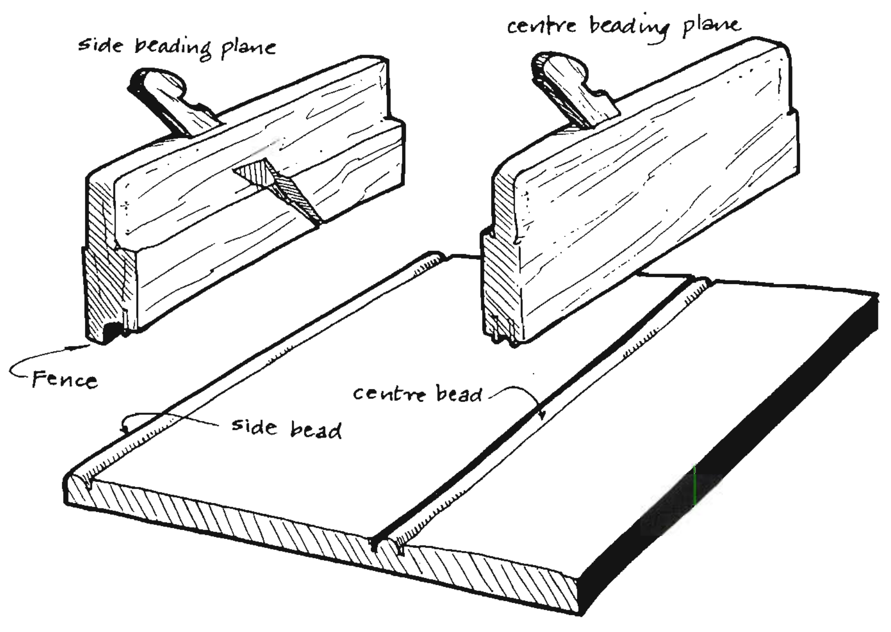


Fig. 1 Two kinds of beads and the planes that produce them.

That store owner might not be entirely correct for calling the object a "moulding" plane. Although the distinction is sometimes a little fuzzy, there is another broad class of these "thin wooden planes" that do not cut mouldings, but are used to cut structural shapes, such as dadoes, rebates, and various kinds of grooves—these are all lumped together under the general heading of "special-purpose" planes.

In the category of "moulding" planes there can be many types. In this article I'm going to talk about those used to cut beads—of all sizes, in various combinations, and in various locations. They're called "beading planes" and are true moulding planes since their purpose is to make an actual moulding, in this case, a bead.

Many Types

Before investigating the various attributes and deficiencies possessed by individual beading planes, first take a look at the different kinds of beads that can be produced. To start with, there is the question of size. Practically all beads, whatever their type or location, can exist in different sizes, from as small as 3/16" to as large as 1-1/2". This is quite a range, especially when you realize that the different sizes graduate in increments of as little as 1/16". This size range holds true for the several different kinds of beads and the planes that produce them.

The bead used most often, and the one that has a useful structural function as well as being decorative, is the side bead. The easiest place to see a side bead is on practically any door or window frame made before 1930. Around the inside edges of the casing, and sometimes in other spots as well, a bead was cut to produce a rounded edge that was both more comfortable to bump into and less likely to be damaged than a square edge. Where the piece of wood in question presents not just one face to the world, like the door or window trim, but two, such as the corner of a bookcase, the corner made by the two faces (the side and the front), might be treated with a return bead—which is nothing more than a side bead worked from both exposed sides. This creates a complete bead with a **quirk** (the little groove at the edge of the bead) on both sides.

The next most common sort of bead is the so-called center bead—so-called because it isn't necessarily in the center of anything, but it is any bead not on the edge. It may be a scant inch or less from the edge or it may be in the middle of a 10" drawer front. It is, however, unusual to find a single center bead so far from the edge; when thus situated it is usually at least doubled and frequently tripled. Traditional terminology requires that more than two beads side by side be referred to as **reeds**, even though planes designed to cut two or more reeds are still called beading planes—cluster beading planes, to be exact.

The way to tell whether you are looking at a side beading plane or a center beading plane is to look for the fence or the absence of it. But take note that this fence should be an integral part of the plane; any fence that appears to have been attached by a previous user may well have been redesigned to turn a center bead into a side bead. Not that this is necessarily a bad thing, but it is good to know exactly what kind of an animal one is dealing with. An interesting bit of confusion sometimes arises from the fact that since two or more beads together are known as reeds, a side beading plane that cuts two beads (that is, a **double side beading plane**) may also be known as a **side reeding plane**.

There are two varieties that are somewhat rare but especially useful, and they should be snapped up at once if you get the chance. They are the **reverse side bead** and the **repeating center bead**. The former is simply a side beading plane that has two irons facing in opposite directions, one on each side of the **stock** (the wooden body of the plane), which enables you to cut the same side bead on the same piece of wood but in either direction—especially useful if you run into contrary grain. Of course, one of the cardinal rules to

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Graham Blackburn is a furniture designer/maker in Bearsville, New York, and the author of many books including The Illustrated Encyclopedia of Woodworking Hand Tools, Instruments and Devices *published by Simon and Schuster, 1230 Avenue of the Americas, New York, NY 10020.*

continued on page 18

follow when using moulding planes is to use "sweet-grained" wood where the grain runs away from you as you plane. Unfortunately, this is not always possible, and in these cases a reverse side beading plane offers a marvelous advantage over a simple single-side beading plane.

The **repeating center bead** is a plane with two or more grooves on its sole but with one less groove in the iron than there are grooves in the sole. What this lets you do is to cut the first groove or bead, and then use the ironless groove in the plane's sole to ride in the first groove while you cut the groove next to it. A moment's thought will make it clear that this is a process that may be repeated endlessly, thereby creating as many reeds as the width of the wood will allow.

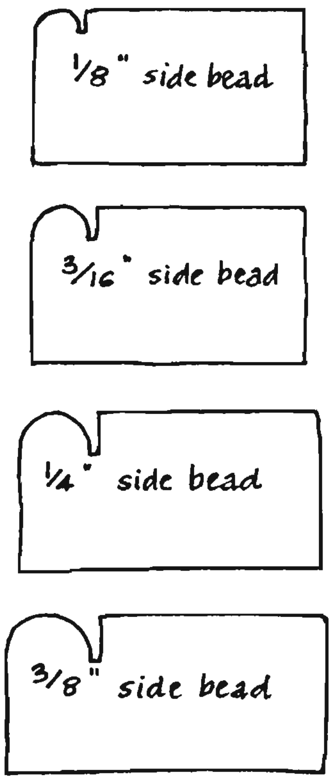

Fig. 2 Graduated series of side beads from 1/8" to 3/8"

As with any class of tool that was manufactured and used over a long period of time, there are endless varieties, and it is not unusual to find planes that cut beads and reeds in other forms than the ones discussed above, such as **torus beads** or **astragals** and other such planes with equally intriguing names. But since side beads and center beads comprise the vast majority, becoming familiar with these two groups will enable you to figure out the mysteries of any other types you may stumble across.

Good Condition

Next let's take a brief look at the actual plane itself in order to determine not only what kind of a bead it cuts, but whether it is in a condition that can be used with success. Firstly, of course, it should have all its parts. The **body** or **stock** should not be checked, cracked, or rotted anywhere. There should be a **blade** (or iron), and a correctly fitting **wedge**. Secondly, inspect the **boxing.** This is nothing sporty; "boxing" refers to slips of boxwood that were sometimes inserted in the sole at points where the plane was subjected to the greatest wear. Boxwood was used because it is denser and more closely-grained than beech (the usual wood used for making planes), and so it lasts longer under repeated friction. While a plane that was originally fitted with boxwood wear strips was a better quality item to begin with, it will be worse than the commonest unboxed plane if the slips have cracked, separated, warped, or fallen out. Repairs are possible, depending on your ability and interest, but to be useable, the strips must be straight and lined up with the edge of the iron.

A fascinating aspect of boxing is the amazing number of patterns used to accomplish it. The simplest form was to insert a straightforward strip, or slip, into the sole of the plane. More expensive varieties were keyed in with different forms of box joints—"box" in this case referring to the kind of joint frequently used when making boxes, not to the kind of wood being used. The most expensive, best-quality examples were dovetailed in, and known, as you would expect, as dovetailed boxing.

Using the Tool

Assuming the plane is complete and in satisfactory condition, with a sharp iron, a well-fitting wedge, and tight boxing (if any exists), you are ready to roll. Unlike the standard bench planes you are probably more familiar with, moulding planes are worked from the far end of the wood, backwards—rather than from the nearest end to the end furthest away from you. The reason for this is that if you start each succeeding pass a little further back, the rest of the pass will be guided by the shape already cut; whereas if you were to start at the end closest to you, the plane would be constantly cutting new ground with nothing to guide it except the force you might be able to exert holding the plane closely to the wood. Since the shape of a bead is curved, the very curve would tend to push the plane off the edge of the wood and the bead would gradually diminish in size until eventually there would be nothing left except the quirk. You must also hold the plane's fence tightly up against the edge of the wood at all times, or the width of the bead will vary and the quirk may very well exit the edge.

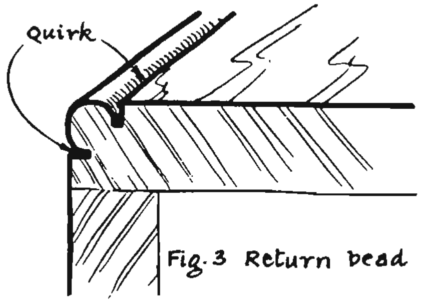

Fig. 3 Return bead

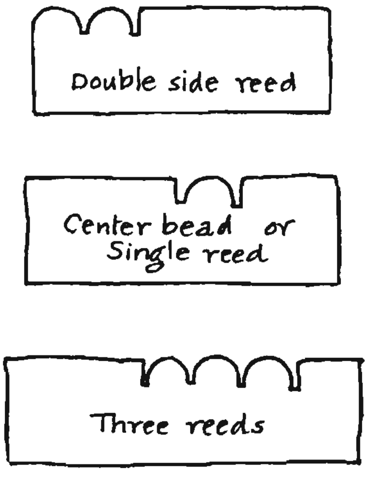

Fig. 4
Various bead combinations

This holds true even for center beading planes, since they too require a fence to work against. For these, the fence is usually tacked or clamped to the work rather

Tried and True

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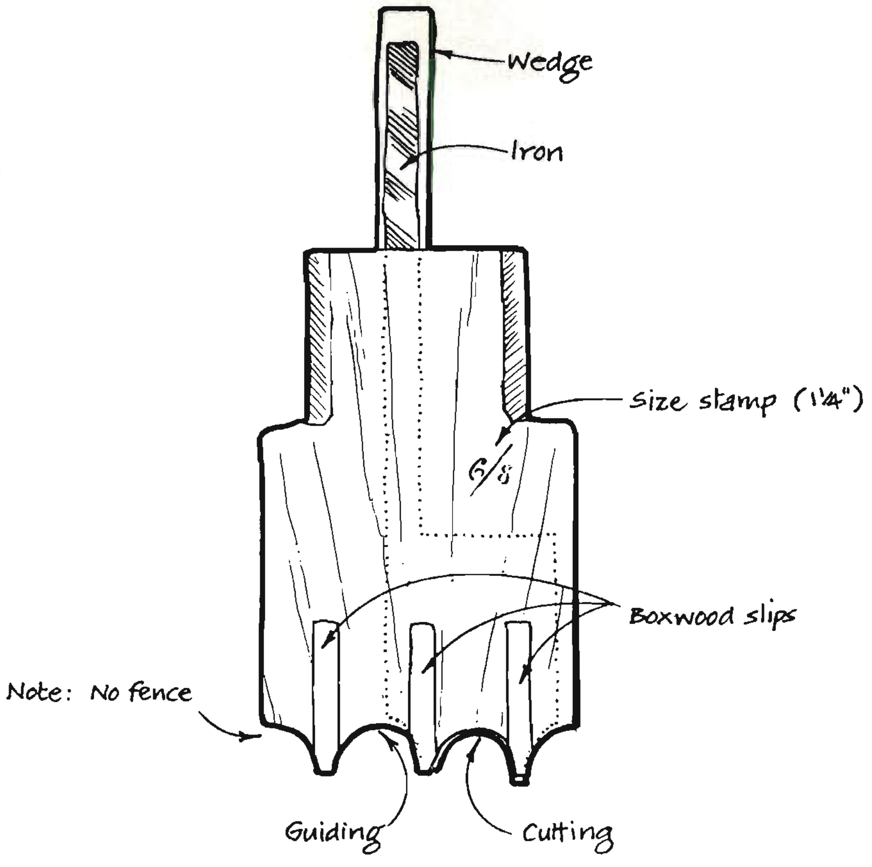
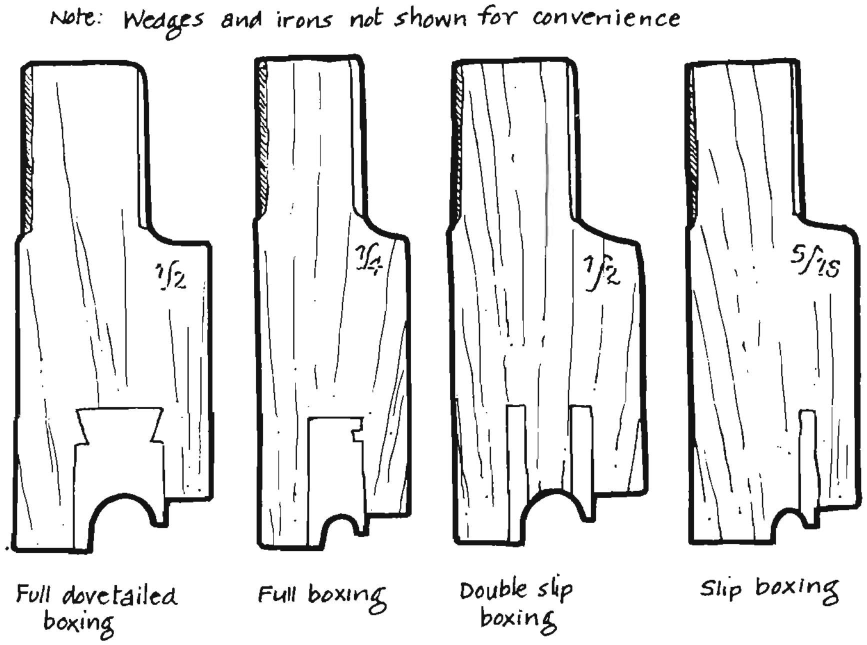


Fig. 5 End view of a Center repeating bead plane



Full dovetailed boxing

Full boxing

Double slip boxing

Slip boxing

Fig. 6 Some of the many varieties of boxing possible

than being an integral part of the plane. The one exception is the repeating center bead plane mentioned earlier. This plane requires no fence since the sole itself is guided by the previously cut bead, however this first bead must be cut with the use of a fence.

Beading planes are never made with "spring." They are always held perfectly vertical in use and never at an angle, as are many moulding planes made with a spring line. An exception to this rule exists and is apparent when you are finishing return side beads—it sometimes helps to hold the plane a little to one side when cutting the second face in order to avoid cutting the second quirk too deeply.

As I mentioned earlier, all beading planes come in a wide range of sizes; it is easiest to start with the middling small sizes, from 3/8" to 5/8", until you get the hang of it, then progress to the large and the smaller sizes. Most manufacturers stamped the size of the bead that the plane would cut on the heel of the plane, but they also sometimes stamped a model number there too, so don't get confused.

Lastly, the "signing" that the seller may have mentioned could be one of two things. On the **toe** (the front of the plane) the manufacturer usually stamped his mark carefully and centered. This, if anything, is what the uninitiated are trying to refer to, since there are collectors who value particular makers, and will pay a premium for certain marks. However, such sellers usually cannot discriminate between the maker's mark, regularly and neatly stamped on the toe, and any owner's marks, more often a less ornate marking and one that may be found on the heel or the toe or anywhere else. Unless you are a collector, the maker's stamp, the owner's stamp, or any other "signature" is completely irrelevant, and will have little effect on the plane's utility.

Sharpening

Probably one of the greatest deterrents to using beading planes is the trepidation felt when faced with the necessity of sharpening the irons. After all, these are considerably different from regular plane irons and chisel blades. Even someone with some experience in sharpening irregularly shaped irons—such as the odd shapes found on the edges of some carv-

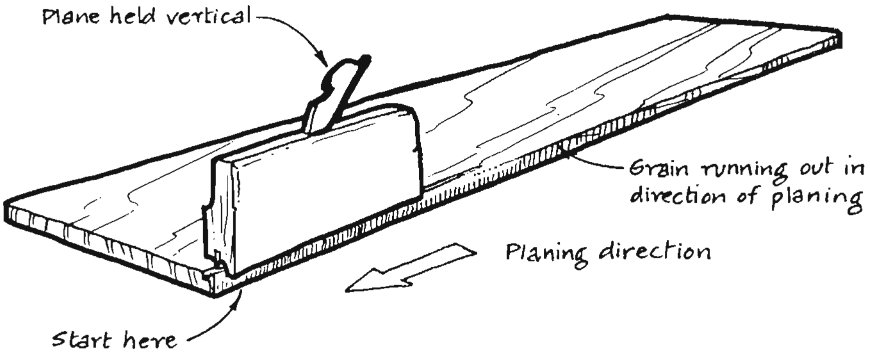


Fig. 7 Points to observe while planing

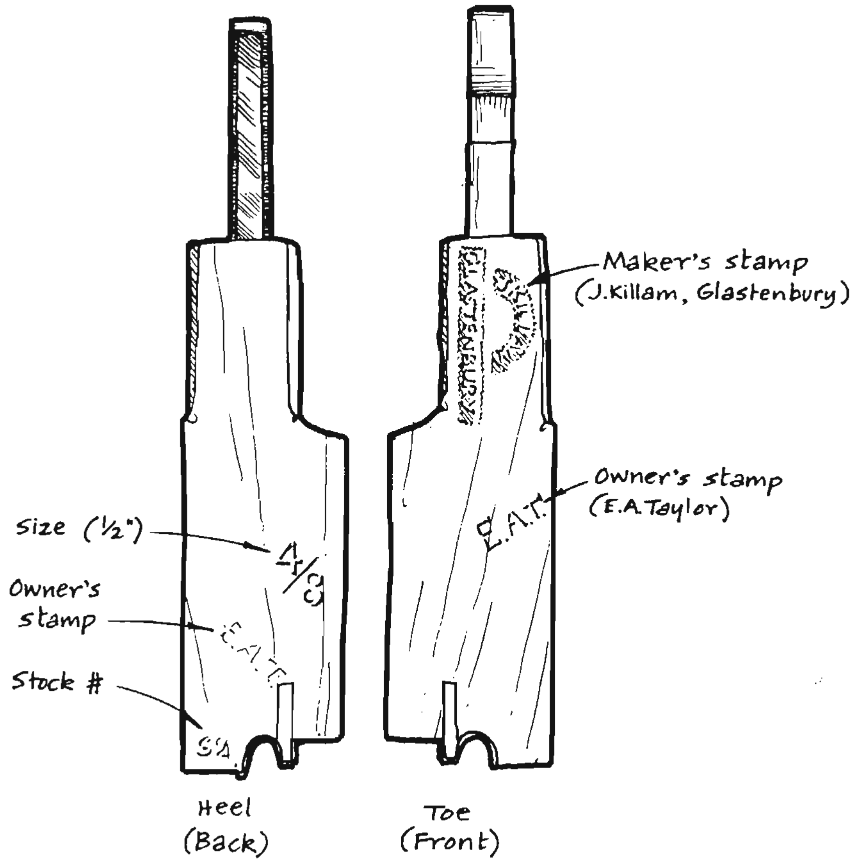


Fig. 8 Interpreting the stamps on a plane

ing tools—is likely to hesitate when considering sharpening a beading plane iron, or almost any moulding plane iron, since there is not only the irregular shape to contend with, but also the fact that the iron must be sharpened in such a way that it keeps the same profile as the sole of the plane Bear this last fact in mind constantly and your sharpening efforts will be well rewarded. Forget it, and be your iron ever so sharp, the plane will work only with great difficulty, if at all.

Check the profiles of the plane and iron by holding the plane at eye level and sighting along the sole. The iron should project evenly from the plane along its whole cutting profile. Some irons, depending on the cut to be made, are so designed that part of their profile remains within the throat of the plane. Close scrutiny of the plane's sole and the design of the cut should make this obvious.

Assuming the iron's profile does in fact match that of the plane's, a quick fix can often be achieved by leaving the beveled edge alone and concentrating on the back of the iron. This should be stoned perfectly flat, using whatever sharpening stone you prefer, so long as the stone itself is perfectly flat. For much of my sharpening I prefer water stones, but these require almost as much work to keep flat as is involved in the actual sharpening of an edge. Whatever you do, take care not to form another bevel on the back of the iron.

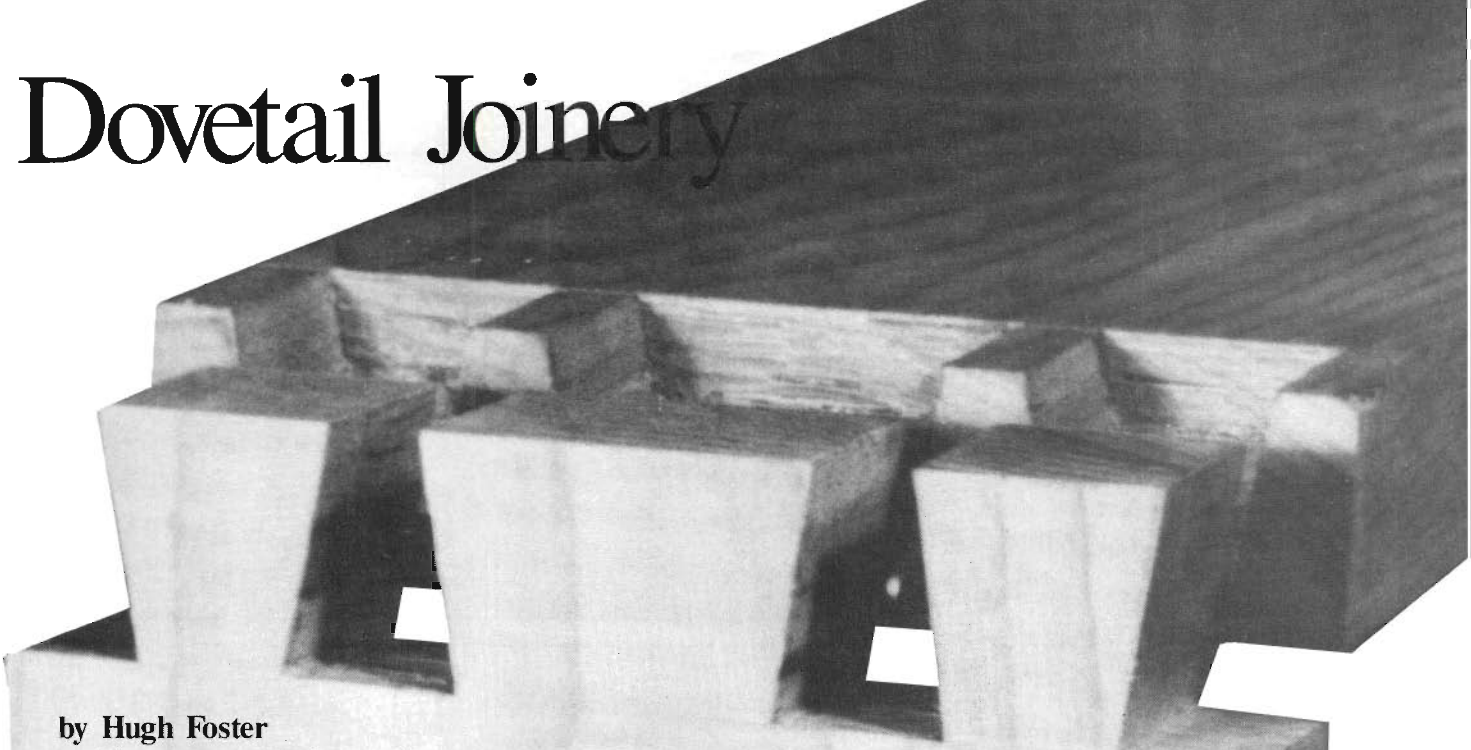
Should the profiles not match, then the iron must be reshaped until they do. Depending on the extent of the correction necessary, you may use slip stones, small files, thin grinding wheels, or a tool that I find especially well suited to the task: the Dremel®, fitted with a tiny abrasive wheel. Proceed carefully and patiently, checking your progress frequently by inserting the iron into the plane and sighting along the sole. When gross corrections are necessary, you may find it helpful to mark the profile on the back of the iron while it's in the plane. With the smaller sizes, this can be very difficult if not impossible, and you will have to do it all by eye.

When the profile has been corrected, check that the bevel is at the correct angle throughout the whole length of the profile. Use whatever works best for you, and work precisely and confidently. Once an iron is corrected, it should not require reprofiling for a very long time if subsequently properly sharpened, so do not think that all this labor is an integral part of using these tools.

The part of the iron of a side beading plane that cuts the quirk can very often be honed on a regular bench sharpening stone, but the rest of the edge will have to be sharpened using round slip stones, or shaped slip stones small enough to fit the required curves.

Quite a few subsequent sharpenings can be accomplished by simply working the back of the iron on a perfectly flat stone. You will be surprised how well and how long a sharpened beading plane iron cuts. So do not avoid the attempt; all you need is a little patience. PW

Dovetail Joinery



by Hugh Foster

When you get right down to it, cabinetmaking is really just the art of making boxes. A drawer is a box and the carcase is a box for holding these boxes.

Forgetting for the moment that these boxes have bottoms, or backs, or doors, or whatever, let's consider the ways in which four perpendicular sides connect to each other. The butt joint, where the face of one piece overlaps the end of another, is the simplest and crudest way to make a box. If you can make four pieces the right length (two sides that are short by an amount equal to the thickness of the ends), then you're in business. You'll need some nails or screws to connect your four pieces, but there isn't much more to it.

At the other end of the spectrum is the dovetail joint. The dovetail is a true "joint" because the boards fit together, each becoming part of the other. Butt joined boards are really just held next to each other by some artificial means, but dovetailed boards interlock together like the fingers of folded hands. There is a similar joint actually called a finger joint that is also good for making boxes (in fact, it's sometimes called a "box joint"). However, dovetails are more intricate with wedge-shaped fingers like the tail of a dove. When the tails of one board are locked in place between the pins of another, you have a joint with built-in structural strength. When glued, there isn't a stronger joint, but it is important to realize that this structural strength works in a particular direction.

The Direction of Strength

Drawers are boxes that get pulled and pushed around by one of their sides a great deal. Every time you open a drawer, you tug one of its sides toward you, while the rest of the drawer and its contents are all held in place by inertia. Push the drawer closed and inertia wakes up, wanting the box and its contents to keep moving while the drawer front slams to a stop against the front of the carcase.

This tug of war with one of nature's forces is why dovetails are the best joint for drawers. By making the tails in the drawer sides, you are wedging the sides into the drawer front so that the action of opening the drawer doesn't separate the front from its sides. If you cut the tails in the front, then you're just not taking advantage of the joint's strength.

This same structural advantage can help battle another force of nature: gravity. The tails should be cut on the sides of a wall-hanging cabinet or other carcase (such as the toolbox on page 31) to keep the bottom from falling off.

Laying Out the Joint

In order to cut well-fitting dovetails, you have to start with stock that is flat and square. Cut your material to the finished size making sure the ends are square to the sides and faces.

Lay out your box (let's say it's a drawer) and determine which surfaces will be inside and which corners will go together. I like to identify the corners as A, B, C and D, and I mark the inside surface at each end of the board to indicate which corner it is.

Locate the groove for your drawer bottom so it will end up in the waste area between the tails in the drawer sides. Since we're discussing through dovetails, you'll have to stop the grooves in the drawer front and back and chisel out the corners so they don't show in the pins. If these were half-blind dovetails (see page 24) you wouldn't have to make these stop-cuts.

Next, set your marking gauge to the thickness of the material and use it to mark the shoulders at each end of your pieces. Mark these shoulder lines on just the two faces of the pieces that will have the pins,

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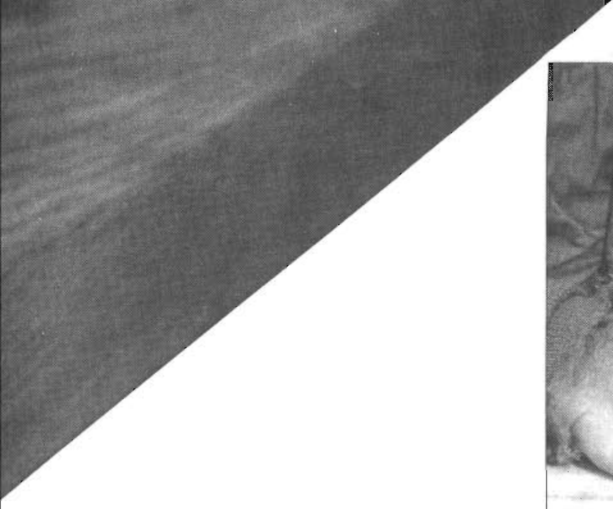
Hugh Foster is a part-time furniture designer/builder in Manitowoc, Wisconsin.



and mark all four surfaces of the pieces that will have the tails.

It doesn't really matter which part of the joint you cut first: the pins or the tails. The idea is to get a perfect fit by using the first piece to mark the sockets for the second. For through-dovetails, I like to cut the pins first because this leaves half-pins to line up with the edge of the second piece while I mark the tails.

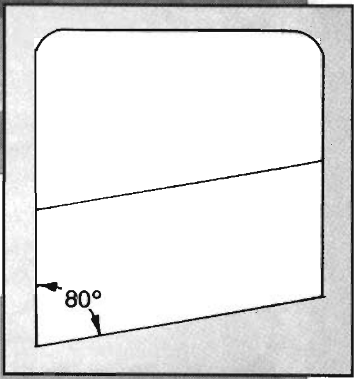
Deciding just where to put the marks is probably the most artistic part of the job. I usually do the layout with a ruler before starting the actual marking. This helps to insure that the spacings are even on both ends of the board, and that they are symmetrical. Typically, I measure from both edges of the board and "split the difference" in the middle. The joint looks best if the pins are all the same size but with differing spaces between them for the tails.

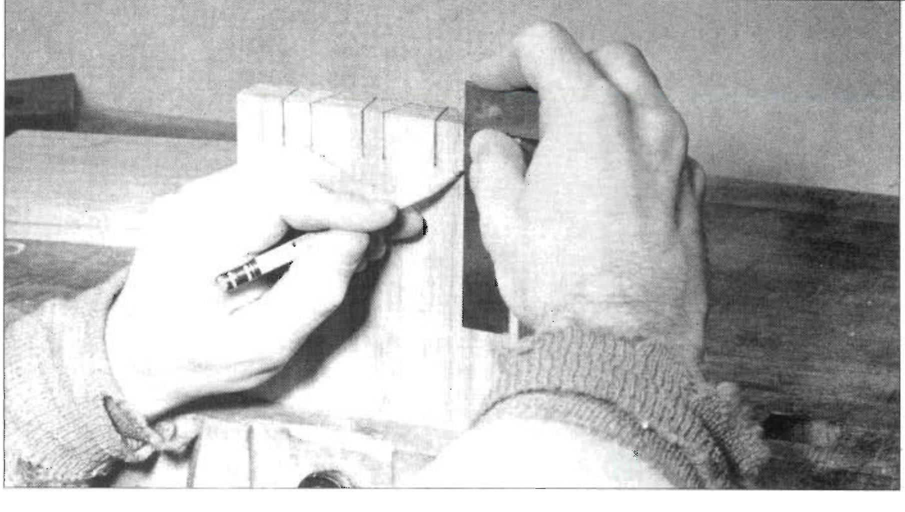
The pitch of dovetails is 1:8. The traditional way to mark this is to set up the angle on a sliding T-bevel by positioning the heel at the one inch mark on a framing square and the toe of the bevel at the eight inch mark.

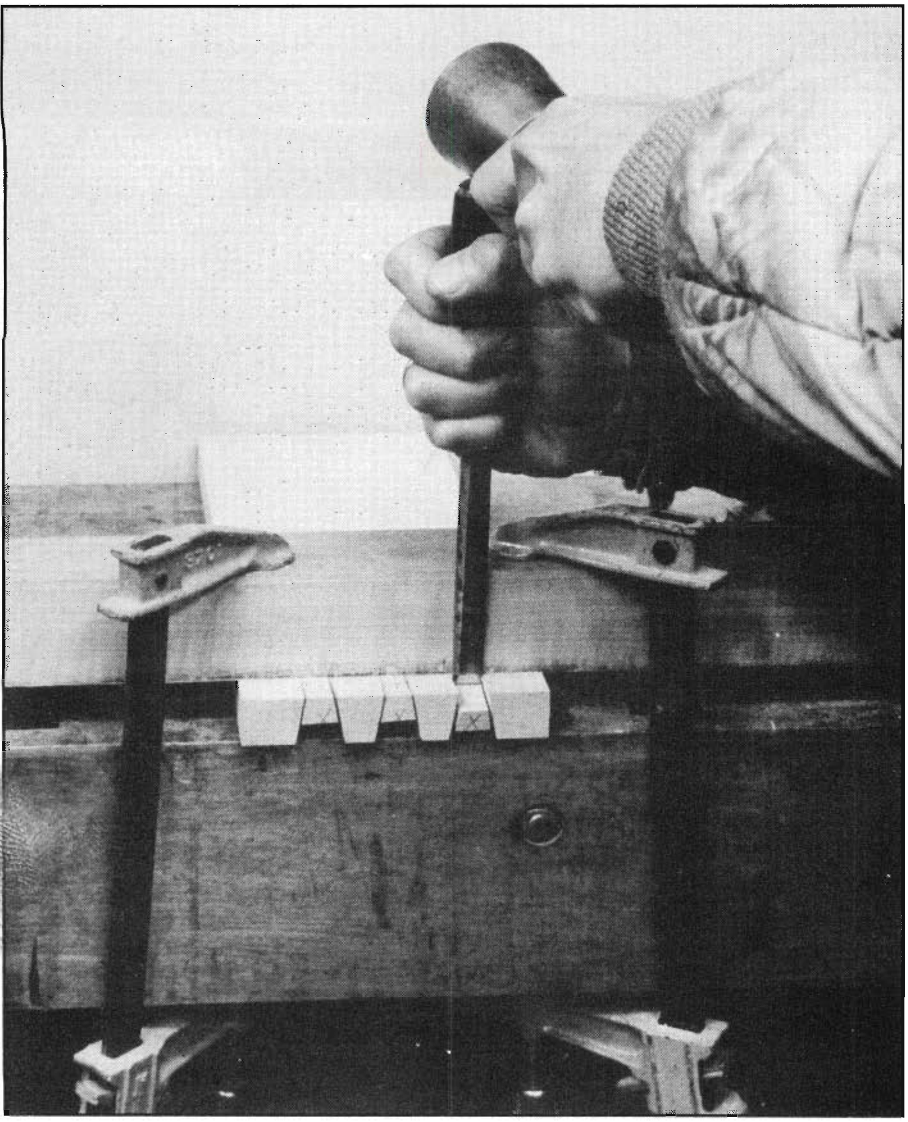
I've made my own marking device which I prefer to the old T-bevel. I took a 3" X 4" piece of scrap and cut one end off at 80°. I lowered the blade to cut into about a third of the thickness, set the fence up 2" from the blade and cut a shoulder on each side of my block by running the 80° end along the fence. I used a tenoning jig to cut the cheeks, then drilled a hole to hang it by, oiled it, waxed it, and put it to use.

Use this device to mark the angle of the pins on the ends of the boards, and then use a square to carry these lines down the face of the board to the shoulder

To lay out the joint, start by scribing the shoulder line with a marking gauge set to the thickness of the wood. Mark the tails on the ends (the author uses his own shop–made marking device shown at right), then use a square to carry the lines down to the shoulder mark.

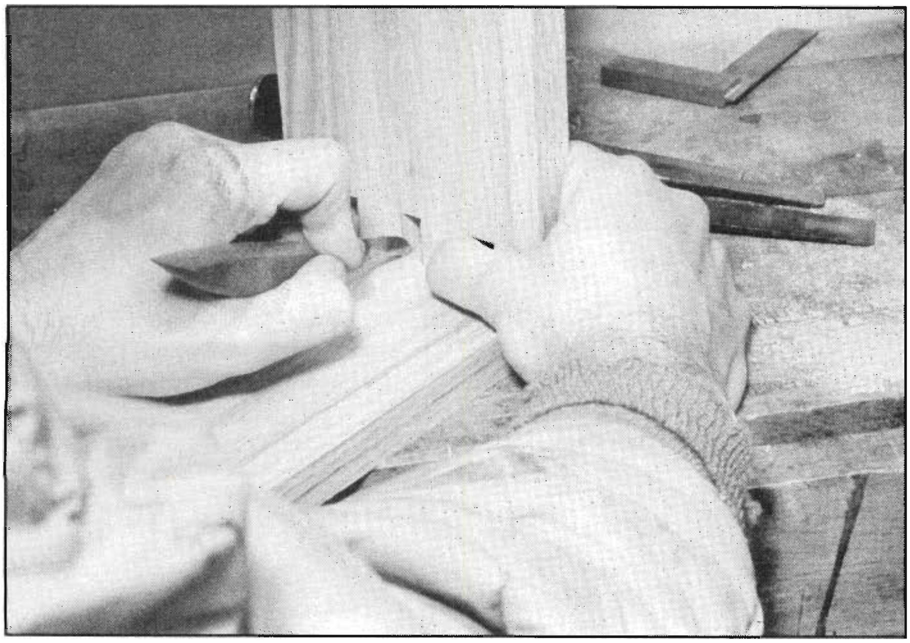






Use a clamp board to guide the chisel while you chop out the waste. When you are halfway through, turn the workpiece over and finish chopping from the other side.

Mark the tails by tracing the pins. Use a knife for accuracy.



lines. Put X's on all surfaces of the waste areas to help insure that you cut out the right pieces.

Cutting the Pins

For our purposes we'll discuss these steps as though you would cut one set of pins and then one set of tails. Though in reality, it's better to saw all the pins, then chop out all the waste before going on to saw and chop the tails.

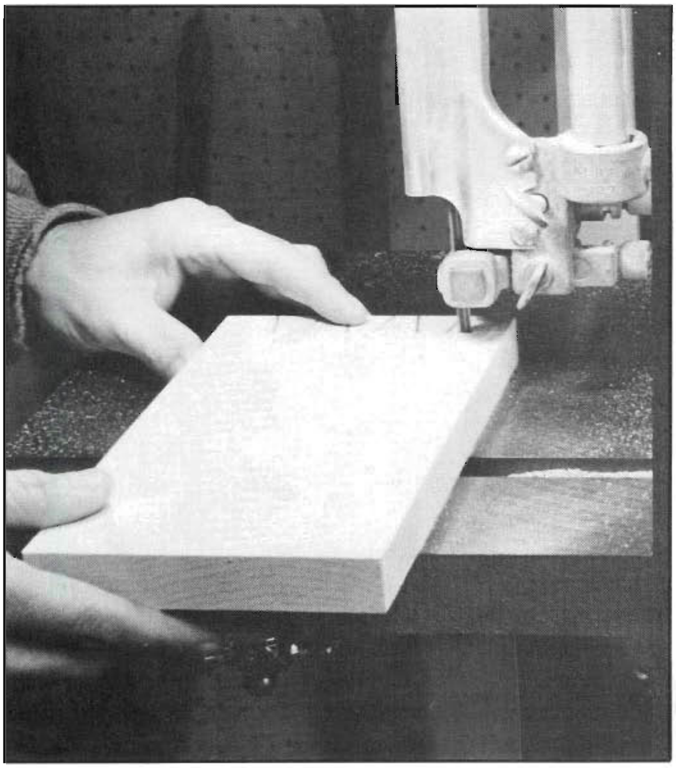
Carefully saw on the waste side of the lines stopping just short of the scribed shoulder lines. Concentrate on holding the saw straight up and down to cut square.

To chisel out the waste, I use a specially prepared straightedge to guide my chisel. This is a straight, square, hardwood two by two that is as long as the widest piece I ever plan to dovetail. I've glued a strip of sandpaper onto one edge, and clamp this piece—sandpaper side down— exactly on the scribed line. This protects the wood from clamp dents, and by holding the back of the chisel up against the board, it ensures a square chop into the wood. The goal is to cut the shoulder square or slightly under cut so nothing gets in the way of the tails.

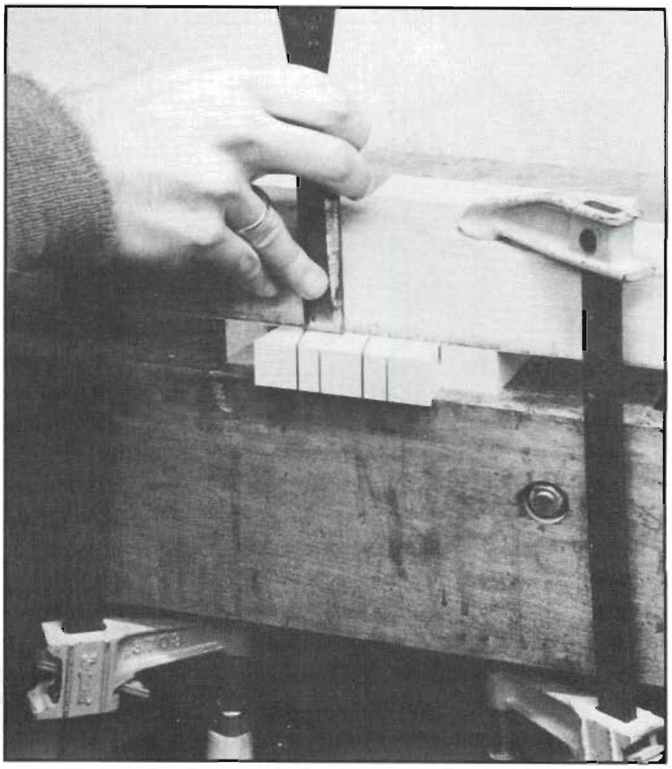
You need to establish a rhythm for this chopping. I count, as to music, and a mallet blow is landed with each "beat." Usually I work all the way across the board with six to eight vertical blows per waste area. This I do from left to right, then work back, right to left, removing stock by tapping horizontally. Another round of vertical blows follows, as does a return trip of horizontal chip removal. This continues until I am just over halfway through the board; then one more row of vertical blows and then I turn the board over. The procedure is repeated just the same on the other side of the board.

After the waste has been removed from between the pins, you need to make sure that the surfaces in-between are square to the end of the board before you use them to mark the tails. Use paring cuts with a chisel to correct any flaws.

Now find the board that has the letter corresponding to the letter on your first piece, lay it down on the bench and use a knife to scribe the exact size and shape of the pins onto the wood. Use a square to carry the lines across the end of the board. Be sure to mark the right areas for waste removal, then saw and chop much as you did to make the pins. If you have marked



Cut the tails and remove the waste for the half-pins on the band saw.



Chop out the waste between the tails much as you did for the pins.

and cut carefully, and if the moon was in the right phase, your dovetails should now go together with little or no fitting.

The fitting operation is hard to describe in particular detail, but it generally comes into being as the result of one of two conditions: relative to your pins, one or more of the tails are either too big or too small. If you cannot have a perfect fit, it is better to err on the side of having the tails too big; then all you need to do is carefully pare them with a freshly honed chisel. If a gap is the problem, your next step will depend upon the size of the gap. If the gap is narrower than the thickness of the kerf of your dovetail saw, go ahead and glue the pieces together and we'll solve the problem as the glue is setting.

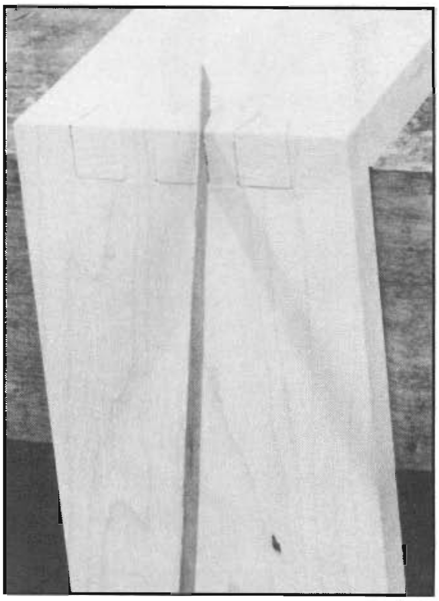
While your glue is drying, try to pull a piece of matching veneer through any gaps. If it is too tight, make a saw-kerf right through the glue. (Sounds like a messy sacrilege, doesn't it? Trust me: this works! Just make sure you have a good coat of wax on the saw and that you wash the glue off the blade immediately afterwards.) Then put some glue on both sides of the piece of veneer (I dip the veneer strip in the glue pot) and pull it through the kerf until the entire gap is filled. When the glue dries, trim off the excess veneer and sand it flush.

Lest you think that I invented this patch, let me explain that there is a school of design suggesting that all dovetails should be so patched, but with a contrasting wood. They call it decoration. From that approach, I derived this idea for a purely utilitarian patch.

I don't want to sound like an idler, but I do really like to just sort of hang around while the glue is setting. I like to start to clean the glue up while it is still the texture of cottage cheese, and I'm not above using a glue injector to spread a little spot of glue into "flawed" spots in my joints. The neater a job I have at this point, the easier the rest of the project will be.

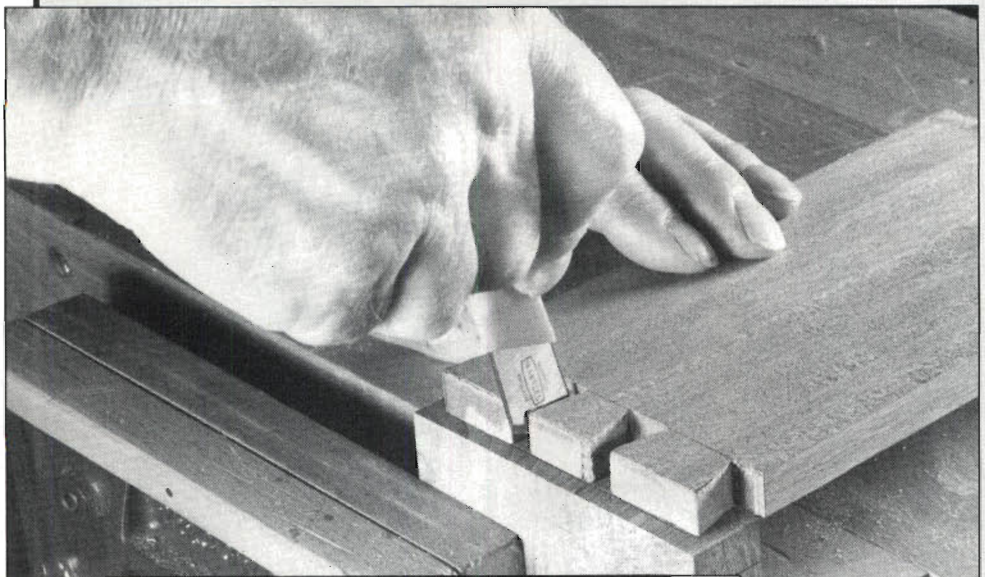
Indeed, the clean up from this joinery can be as easy or as tough as the individual woodworker wants to make it. Certainly chisels and cabinet scrapers are permissible; so's a plane. I often use a belt sander on the outside surfaces. It may be heretical in the religion of hand woodworking, but it's efficient, quick, and cheap. As a last step in this clean up process, I like to put a small chamfer along the corner of each dovetail: two fine plane-shavings followed by a few strokes with a piece of fine sandpaper chamfers the edges nicely.

When you cut your first set of dovetail joints, it will seem to take forever, the results will be less than perfect, you will be frustrated, and you will neverwant to do that again. Don't despair: I had cut a total of 24" of dovetails in my entire career when I took a commission to build a suite of furniture that had something like 72 running feet of carcase dovetails. I sand, "Sure, I can do that," took the client's deposit, and then spent the next week wondering "what in blazes am I gonna do?" I got enough practice in that unprofitable project to now be a proficient, perhaps expert dovetailer. It's my favorite, the best looking, and strongest joint there is. **PW**

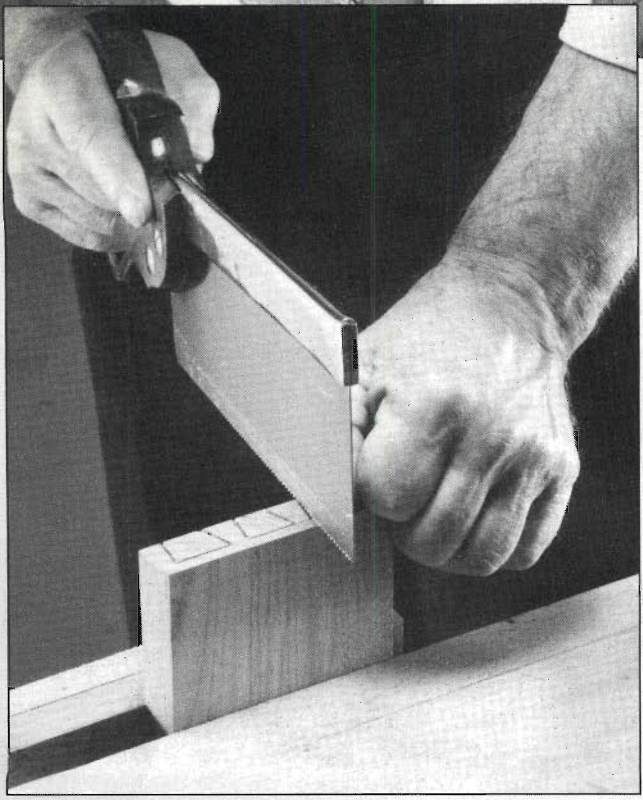


Fill any gaps by widening them to a saw kerf and sliding a strip of veneer into the gap.

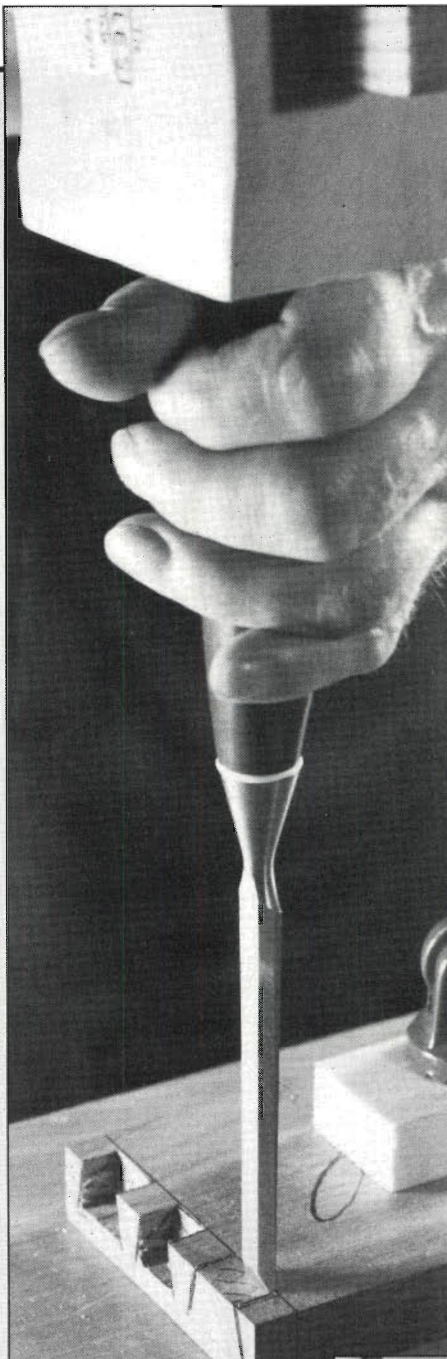
Half-Blind Dovetails



Make the length of the tails equal 2/3 the thickness of the drawer front. Mark the pins by tracing around the tails with a knife.



Start the saw kerf, then finish the cut at an angle so that you don't cut into the lap portion.



Remove the waste using repeated blows along the shoulder line alternating with horizontal taps to clear the chips.

John Sainsbury *is the founder of the Studio for Woodcraft where he teaches students from around the world. Among his many books are* Planecraft - A Woodworker's Handbook *and* Woodworking Projects With Power Tools *(Sterling Publishing Co.)*

by John Sainsbury

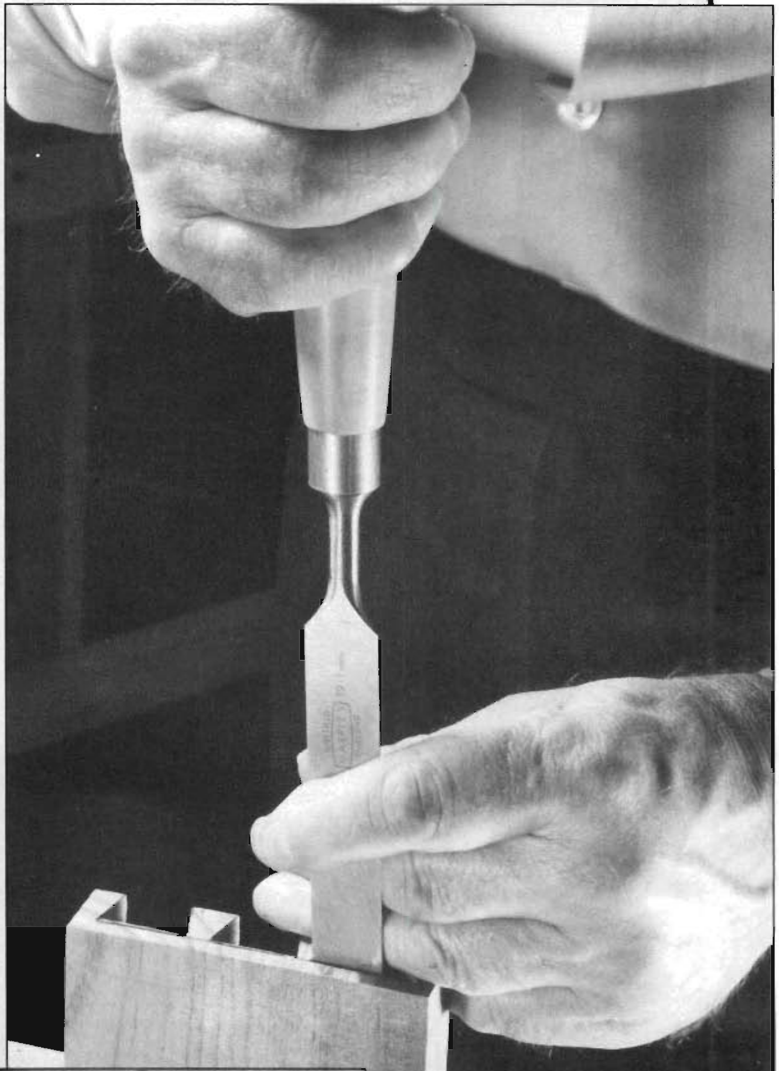
Half-blind dovetails are not much more difficult to cut than regular through-dovetails. In this instance, it's better to cut the tails first since the "laps" can interfere with the marking.

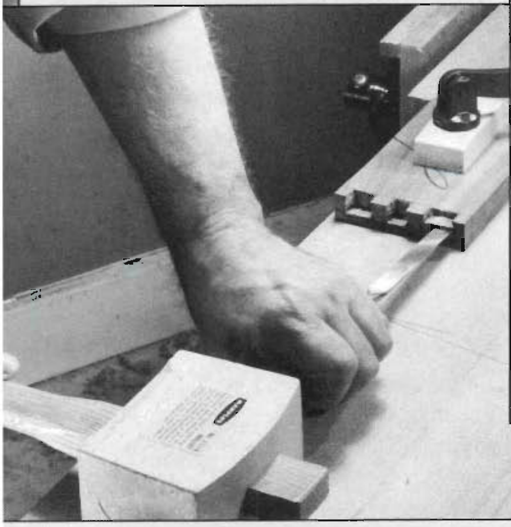
Set the marking gauge to two-thirds the thickness of the drawer front and use this to scribe the shoulder lines for the sides. You will need to change the setting for the full thickness of the drawer sides to establish the depth of the sockets in the front piece.

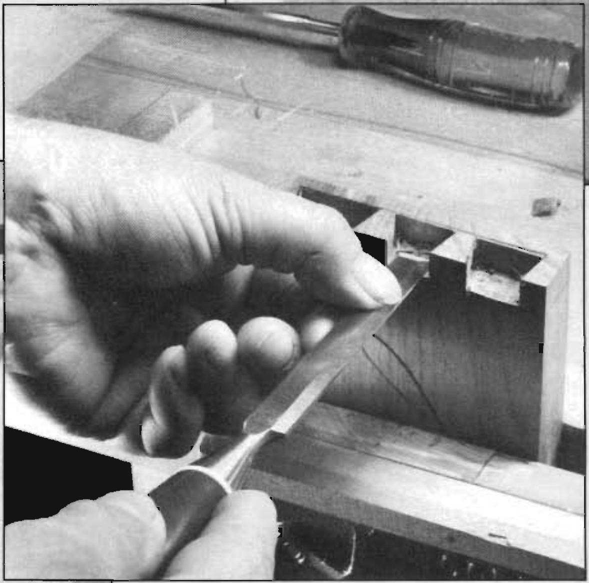
Cut out the tails as usual, then lay the completed piece on the end of the drawer front with the tails held against the scribed line, and carefully outline them with a knife. Square these lines down the face, mark the waste in pencil, and mark with a knife those lines across the grain which have to be cut with the chisel.

Carefully saw down each line as far as possible without cutting into the lap portion on the front. Cut on the wastewood side of the line and stop each cut a little before the line is reached.

I prefer to chop out the waste well away from the lines and then carefully trim back to the line after the bulk has been removed. PW



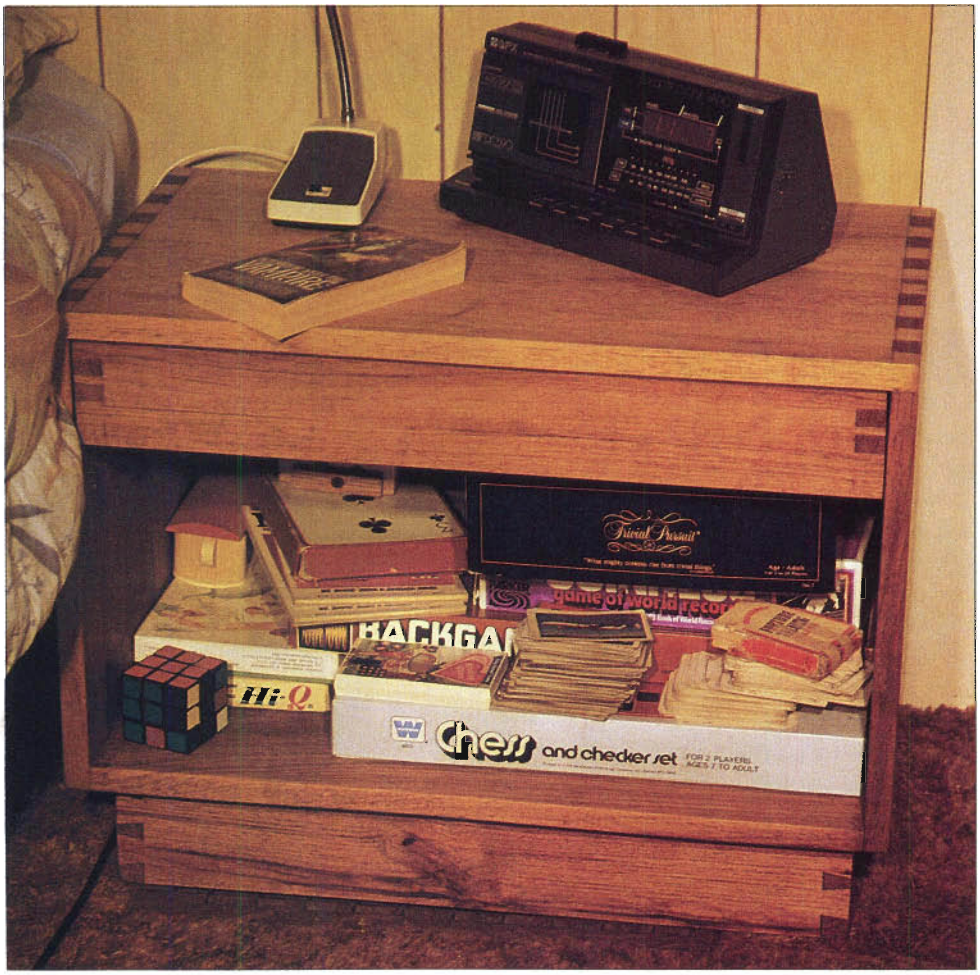




Cut just short of the lines during the initial waste removal, then carefully pare the wood back to the marks and test the tails for fit.

A Popular Woodworking Project

The Nightstand My Daughter Built



by Hugh Foster

Some years back, my oldest daughter wanted to do some woodworking for a 4-H county fair project. I didn't really want her in the shop. She was only twelve years old, not especially cautious, and given to beginning projects and then working on them only when fancy struck. That wasn't going to happen in my shop! I couldn't afford to have my tools or workspace tied up by the whims of a twelve-year old. So, when she told me that she wanted to build a project, I tried to frighten her away. I suggested some useful items, and she settled on the idea of a nightstand. The only thing I insisted upon was that the design be the height of her bed, and that it feature some dovetails. If anything would chase her away, the dovetails would, or so I reasoned.

We started by drawing a picture that wasn't nearly as good as the one here, but it was enough to show what needed to be done. With a great deal of my help, Amy jointed, planed, and glued up a panel just shy of seven feet long. From it, we crosscut the pieces for the carcase. Next we cut out the base pieces, but saved the drawer pieces "in the board" until later.

Then Amy and I laid out the pins and tails uniformly 1" across the top, with the exception of the center one which was just over 1/4", using my homemade dovetail layout gauge (see page 21). For practice, we cut the base dovetails, first sawing, and then chiseling out the waste. After fitting the four pieces together and planing them flat enough to use, I was surprised to see that her dovetails were nearly as good looking as mine, and the pecan she had chosen for the projects was simply gorgeous. Maybe I had been an effective teacher; certainly she was an enthusiastic - if incredibly slow - novice woodworker.

She started dovetailing the top where there was hordes of material to be removed, and it seemed to take her forever.

When he's not pursuing freelance writing or teaching English, ***Hugh Foster*** *designs and builds custom furniture in Manitowoc, Wisconsin.*

Amy worked indefatigably at it, and we were both gratified to see the quality dovetails on the 14-1/2" wide panel.

The amount of time the dovetails took, and my sense of her waning enthusiasm, not to mention my anxiousness to resume my own projects at my own pace, led us to forgo the dovetails at the bottom of the carcase, substituting with a reasonably handsome and quite serviceable joint created by cutting a 3/4" wide rabbet from the bottom of both side pieces, and then screwing the bottom into it at about 2" intervals. By planning for this a little bit, we were able to complete the joint without leaving the crude appearance of a rabbet joint: it was simply a question of accurately notching the bottom and leaving a tab on the sides.

After that, we fastened the carcase to the base with wood screws and proceeded to mount the framework for the small drawer. Amy routed a 3/4" wide X 3/8" deep slot in each side of the carcase stopping 3/4" from the front using the carcase top as the guide for the router base. She took several shallow passes instead of "hogging out" the dado in a single pass, which helped her to keep the router under control.

A hand-wide slot was cut at the front center of the frame so the drawer could be opened without having to mount a knob or pull. The frame pieces were splined and installed by sliding the front one in place first, and then gluing the frame sides into the groove.

The drawer is as much for decoration as anything else. The sides are made of the same hardwood, and are through dovetailed into the front. The back of the drawer could have been dovetailed, but instead we sacrificed a little bit of drawer space to speed the process with a pair of dadoes 1-1/2" from the back of the side pieces. A pair of rabbets on the bottoms of the drawer sides, and a corresponding saw kerf in the front made it possible to mount the drawer bottom with glue and brads.

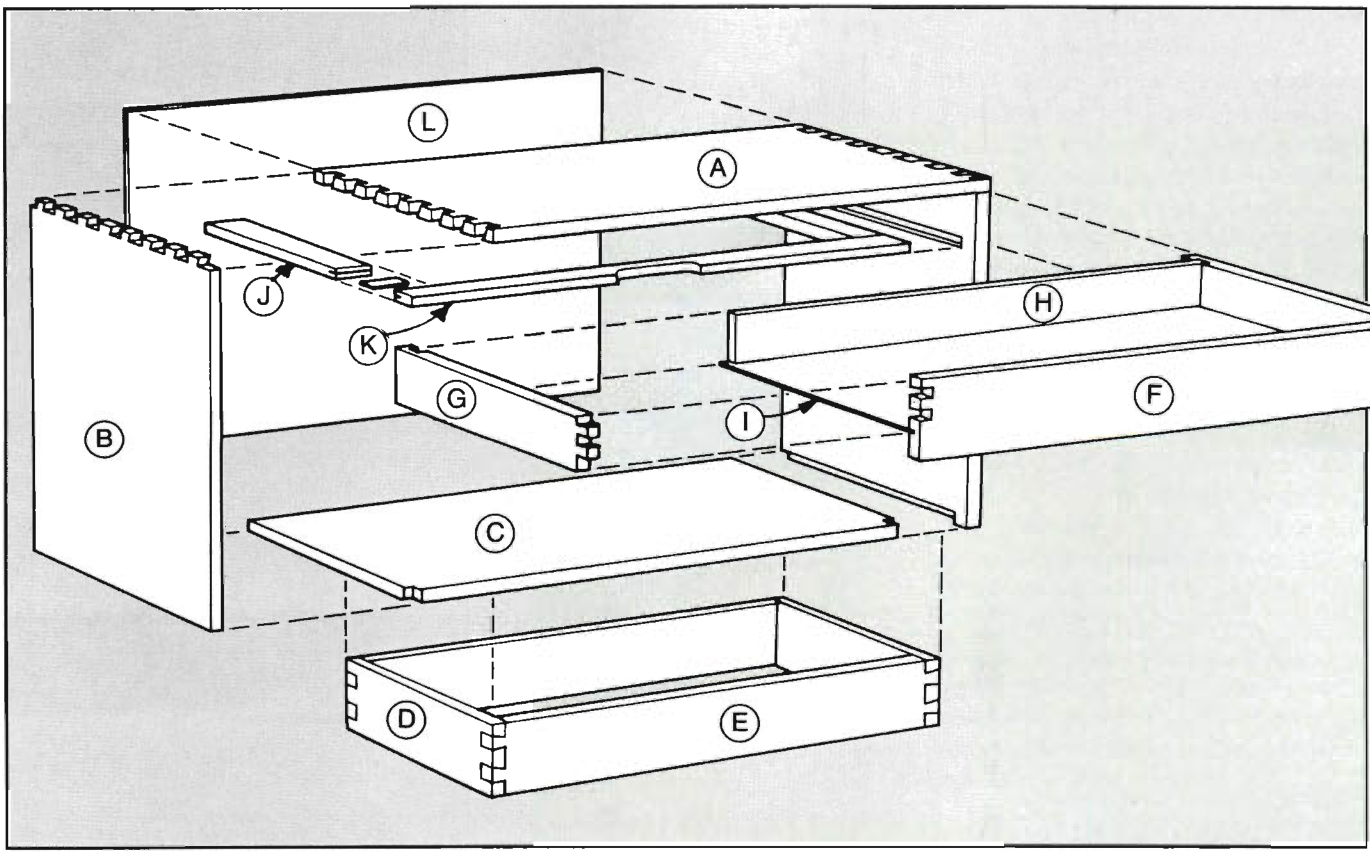
At this point, a rabbet was routed in the back of the carcase, and the corners were squared with a chisel. Into that we mounted a piece of 1/4" birch plywood. All that remained was to sand the unit for finishing. When the sanding job passed my inspection, we began the oiling process. The sturdiness of this type of finish became apparent to me only lately, for this project was built about seven years ago, and it has moved about and seen more severe use than many of my projects, but it still looks fine.

The end result of all this was that my 12 year old daughter made herself a beautiful nightstand, and I had to humble myself with the realization that even a first-time woodworker could cut respectable dovetails. PW

Nightstand

Cutting List

Qty.	Part	Finished Size T	W	L	Piece
1	A	¾"	14½"	24"	top
2	B	¾"	14½"	15"	sides
1	C	¾"	14½"	23¼"	bottom
2	D	¾"	3⅝"	12"	base sides
2	E	¾"	3⅝"	22"	base front and back
1	F	¾"	3⅜"	22⅜"	drawer front
2	G	¾"	2½"	14"	drawer sides
1	H	¾"	2½"	21⅝"	drawer back
1	I	⅛"	13¼"	21⅝"	drawer bottom
2	J	¾"	2"	11½"	frame sides
1	K	¾"	2"	23¼"	frame front
1	L	¼"	14¼"	23¼"	back



Focus on Carving

Carving an Arabian Stallion

Part 3

by William H. McMaster

In this third and final article on carving a racing Arabian stallion I will describe the final detailing and discuss some of the design principles used. As mentioned at the onset, to portray the horse in all his splendor, the prominent anatomical features must be known to give believeability to the sculpture. The goal then is to have a realistic representation with just enough form to imply detail, and not just a "taxidermic" re-creation. This will hopefully awaken the imagination of the viewer and cause him to mentally fill in the details through the power of suggestion. To truly be a work of art, a sculpture must involve the viewer in its interpretation.

For this type of fine detailing, I prefer to use skews and shallow gouges which have been mounted in a 5/8" dowel rod with only a short section of the blade protruding. I make these quite easily using a belt sander to shape a 6–1/2" long handle, into which the blade is held with epoxy. When carving, hold these tools as you would a pencil. For maximum control, steady the blade with the index finger of your left hand as shown in Figure 1.

Carving the Eyes

The first major feature to carve are the eyes. The technique is similar to that used for the human eye (see "Carving the Human Head - Part 5" in issue #32 — August/September 1986), but the shape and orientation are different. The steps to be followed are illustrated in Figure 2.

First outline the eyeball with a small skew to form a stop cut. Since the eyeball is a sphere, it is easiest to first remove a triangular section at each corner of the eye by making two stab cuts with the point of the skew. A third cut along the base of this triangle will remove the triangular chip. This establishes the depth of the eyeball.

The third step is to shape the eyeball into a sphere using either a skew or a #3 gouge held upside down to match the sweep of the gouge to the curvature of the eyeball. To use this gouge technique, sharpen a micro-bevel on the inside of the

William H. McMaster is Chief of the Education Division of the California Carvers' Guild. His "Focus on Carving" is a regular feature in PW.

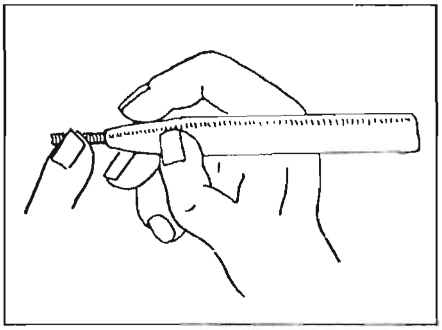


Figure 1. Holding the detailing gouge

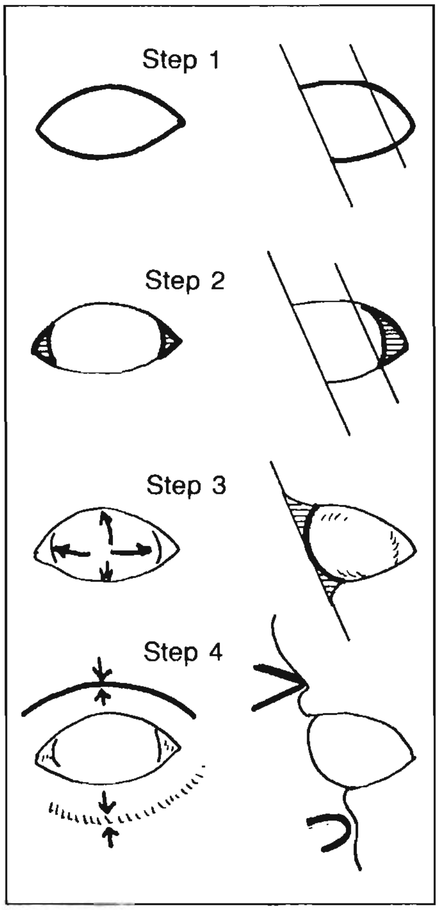
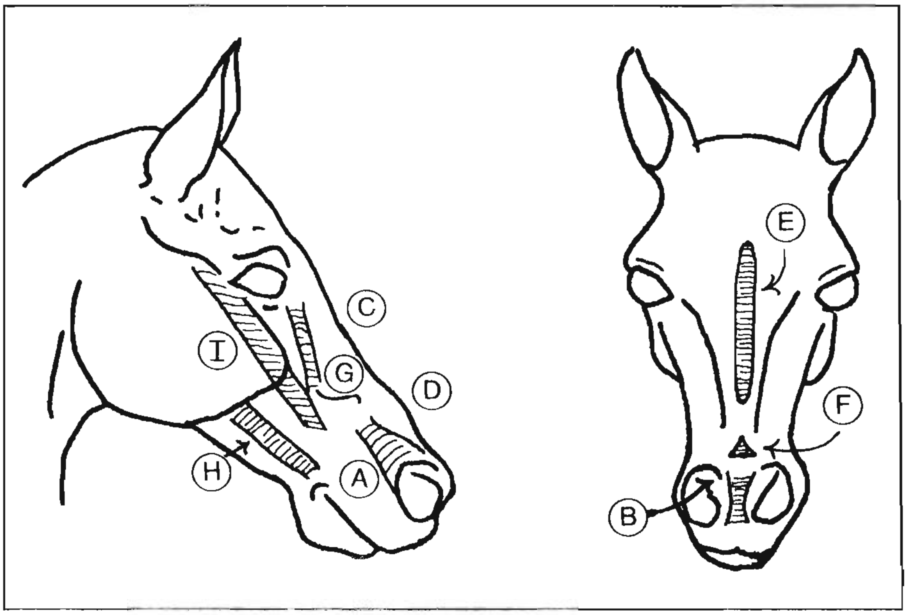


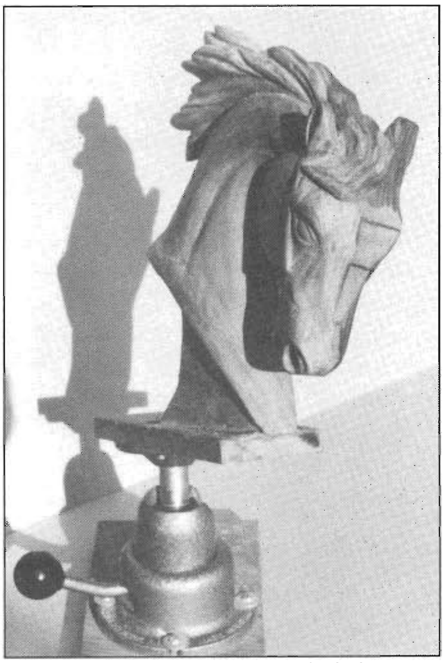
Figure 2. The steps in carving the eye.

Figure 3. Surface expressions of the muzzle



gouge to keep it from digging into the wood. Cut toward the stop cuts, gradually working the shape down along the edges from the center of the eye. Note that the horse's eyeballs really bulge out and are very prominent, and strive to achieve this in your carving.

The fourth step is to carve the upper and lower eyelids. The upper lid is very prominent, emphasize this by starting the shape with a deep cut using a V-tool. The lower lid is not as prominent, so start it with a shallower and smoother groove using a U-tool. After these starting cuts have been made, shape the eyelids using #3 gouges.



This photo shows how the carving looked in its blocked out form (right side) compared to the detailed left side.

While carving the eye, further develop the triangular surface which lies between the eye and nostril. This also includes the initial shaping of the masseteric ridge below the eye. This region was previously roughed out following the directions given in Part 2 of this series (issue #37 — June/July 1987).

In a horse's eye, the iris is very large and not easily seen; therefore, I have chosen not to carve any details in this area.

Progress to this point should be the same as shown in the photograph of the partially finished horse. However, I would recommend that both sides of the head be brought along at an equal pace and not as shown in the photograph. My carving was done this way only to show how it looks before and after these steps.

Carving the Muzzle

The muzzle section includes the nostrils, mouth, and chin. The details of these features that will be represented are shown in Figure 3.

Start with the nostrils, since they are the dominant feature in this region. It helps to think of the nostril as a section of a cone with its surface indication as shown in the Figure. The Arabian horse has fairly large nostrils. Outline this cone (A) using a deep gouge and then smooth it with shallow gouges. When carving the opening, be sure to include the inner wing of the nostril (B). It is best to shape the upper surface of this wing first before any undercutting is done. This allows you to get the right shape before you remove the excess wood from below. Doing otherwise, might not leave you enough wood.

In the front between the nostril openings there is a depression, so the flare of the nostrils continues all around the openings.

When shaping the profile of the muzzle, note the facial dish in front of the eyes (C) and the nasal peak (D) below it. The Arabian horse has a very noticeable dish; however, I prefer not to emphasize it as much as some sculptors do.

The next details to notice in the front view diagram are the two depressions; one a long narrow groove in the region of the facial dish (E), and the other is the slight triangular depression at the bottom of the nasal peak (F).

The mouth and chin are the next to be carved. The horse's mouth does not smile; notice the slight down turn at the end of mouth. The lips at this point bulge out as shown in the cross sectional view of Figure 4. Moving forward, the bulge of the lips slowly disappears. Below the mouth there is the very definite rounded mass of the prominence of the chin. These are the main features to model while carving.

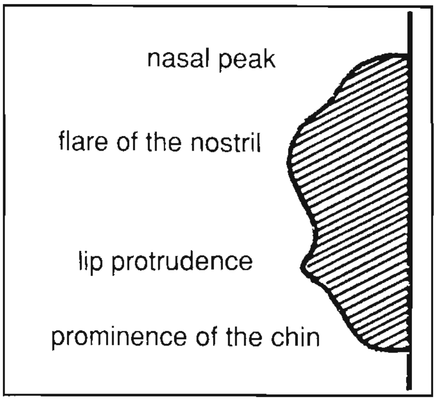
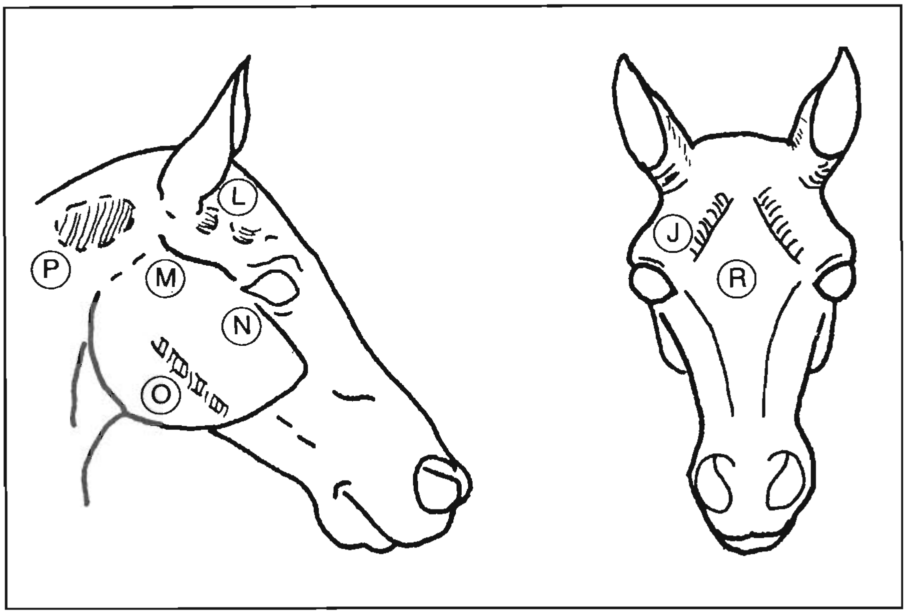


Figure 4. *Cross sectional shape at the mouth.*

As usual, the mouth is started using the V-tool, but use a skew to shape the curve and sharpen the edge. The skew works better for the final cuts since you can cut both sides of the valley going with the grain.

To finish the muzzle, indicate the three muscles that control the mouth. They are the levator (G) running from in front of the eye to the upper lip, the depressor (H) which controls the lower lip, and the zygomaticus (I) which is attached to the zygomatic arch and follows the masseteric ridge. These three muscles have a

Figure 5. *Surface expressions of the upper head.*



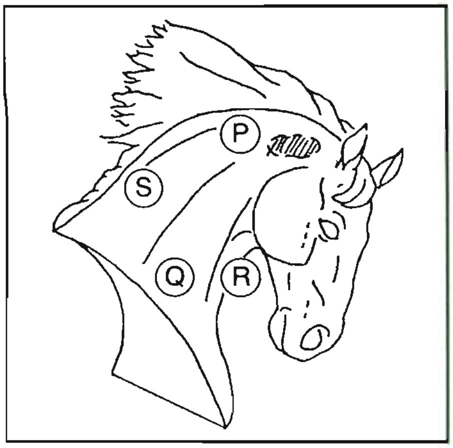


Figure 6. Features of the neck.

very definite surface expression and should be indicated as should at least one of the veins in the nasal region.

Carving the Upper Head

Figure 5 shows the major features which give further definition to the upper head. There is a cylindrical muscle region (J) above each eye which curves down to the triangular frontal bone (K) and also a hollow area (L) around the zygomatic muscles.

The jowl itself is not flat, but slightly convex with the upper end delineated by the zygomatic arch (M) which protrudes, and by the masseteric ridge (N) which recedes. Be sure to model this reversal of forms. To add interest to the jowl, I have added one of the veins in this region (O) to give a surface variation. Behind the jowl, on the neck, is a depression caused by the wing of the atlas (P).

When carving the ears notice the inward tilt of the pointed ear tips and the tubular shape of the lower ear. The ear tips are thin, giving a definite concave shape to their profile.

Features of the Neck

For the neck, give an indication of the major muscles as shown in Figure 6. These are the depression at the wing of the atlas, the large bulge of the brachiocephalic muscle (Q), the jugular furrow (R), and a slight depression near the mane (S) due to the muscles in that area.

When the carving has been completed, it should look pretty much like the one shown in the photograph. My carving, done in Honduras Mahogany, was finished using McCloskey 0007 Deep Flat Varnish.

A good carving requires a good design concept as well as good craftmanship in the execution. Each artist should have his own set of design goals to guide his sculpture. Let me briefly discuss some of mine as they relate to this particular piece.

Since the carving is depicting a racing stallion the images to emphasize are Rhythm and Mobility.

Rhythm is produced by the movement of the eye over the sculpture. This movement of the viewe'rs eyes must be drawn over the piece in a pattern preconceived by the artist. This is achieved by the flow of lines through the subject which can be either real or imaginary. The lines of rhythm chosen for this work were the S-curve and the spiral as shown in Figure 7.

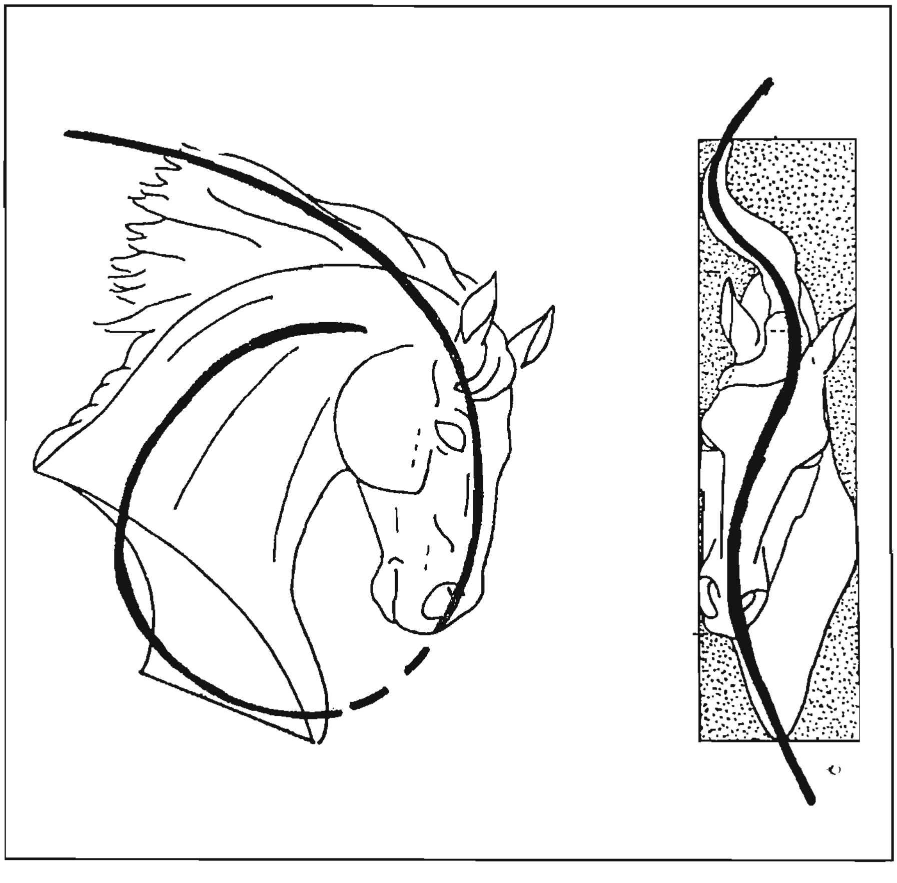
A sense of mobility can be created in various ways. One way is to vary orientations to an axis of reference. In this carving it was done by the tilt and rotation of the head. Diagonals and curves also express movement. Notice how the support section, formed by the two diagonals pointing in the direction of motion, suggests a speeding arrow; further implying speed.

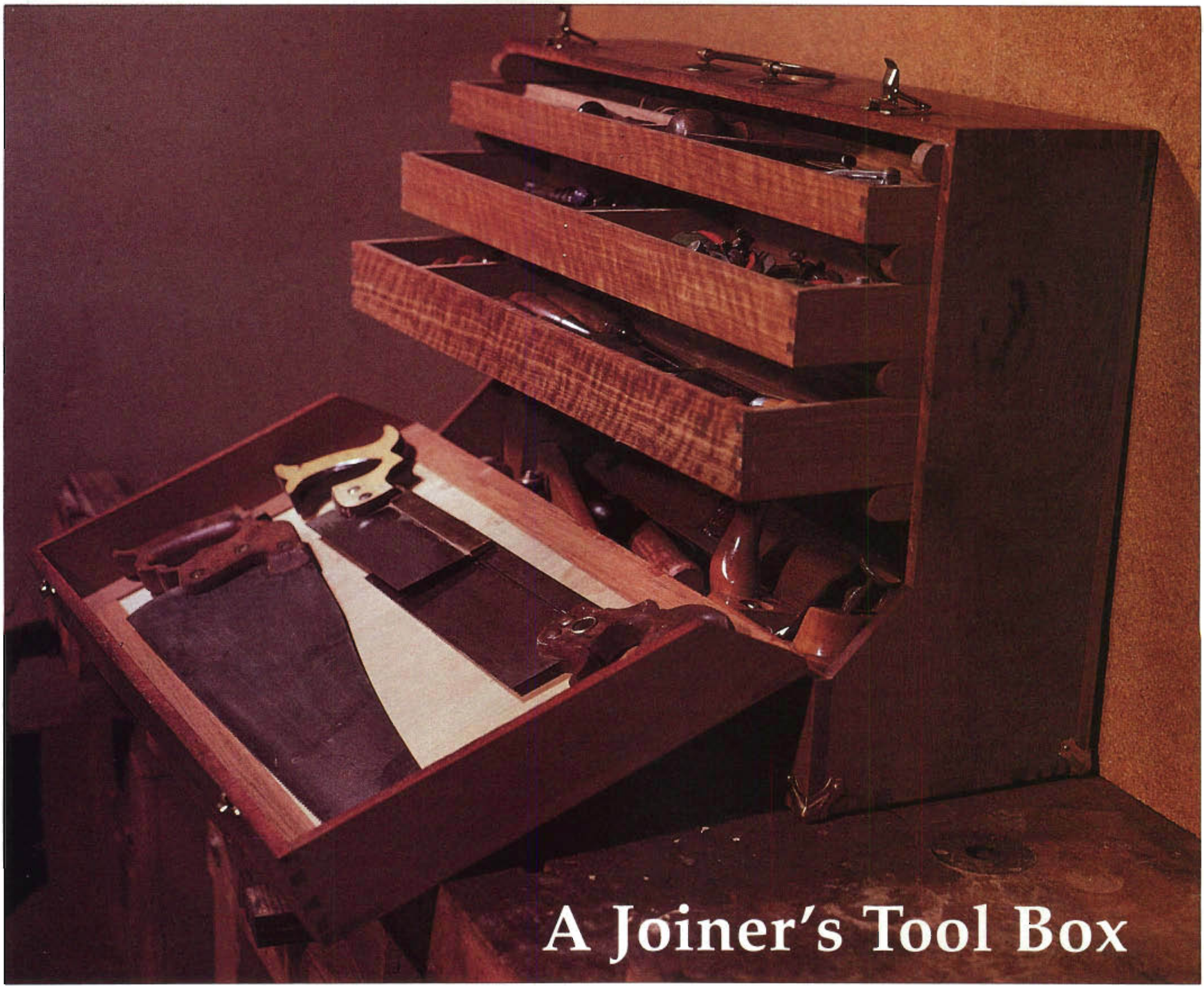
The S-curve of the mane and its lack of detail are also intended to produce this illusion of motion. When looking at a racing stallion, you could not focus your eyes on the flowing mane; thus the carving of the mane should also not show any detail which would create a static effect.

The other design concept to be achieved is the sense of credibility. This is where the artist shows his sincerity by putting his best into the carving and representing all the necessary natural features. Nature is known to abhor straight lines and flat surfaces; these are removed in the animal by his musculature, and other surface variations due to anatomical features. The carving must have these forms to give these impressions through the use of light and shadow. Light falling on an object reveals its shape through the tonal values of the reflected light — thus three dimensional qualities are perceived. It may sometimes be necessary to overemphasize the curvature in order to achieve the desired optical effect. To accomplish this, always inspect your work with a strong side light.

In future modeling, the carver must always remember that art is not a copy of nature, but a representation through the artist's unique impression. I hope that you have enjoyed this project and have made variations from the design to suit your own feelings on this subject of the racing Arabian stallion. **PW**

Figure7. Lines of rhythm.





A Joiner's Tool Box

by Joe Petrovich

A tool box is more than just a box of tools. It is a reflection of the craftsman's attitude toward his equipment–not just how he transports it, but how he organizes and protects it. A tool box is also traditionally a showcase of his abilities—how facile are the joints, the fittings, the finish; and last of all, the craftsman's tool box is a link–our own personal link to the history and heritage of woodworking.

That was the jist of Mr. L's introduction in Wood Work II class some thirty years ago to our first serious project. It impressed me very little at the time because I was not going to be a woodworker. (I had plans of becoming a surgeon, a pilot, or a monk–either medieval or Buddhist.) Wood Work II was not for me. It was actually avoidance of Handicraft II which was making candles and potholders. In those days dorks made pot holders. And though surgeon, pilot, or monk I might be, a dork I was not.

Mr. L's introduction, though it seemed a bit overblown and dramatic at the time, was true. A tool box is more than a box full of tools. It ought to allow us to be organized, protect our equipment and present a good image to those eventual onlookers.

The design of most of the tool boxes from the last two centuries is based on the old jointer's box. Initially designed to accommodate a large number of planes, saws, augers, chisels, gouges, and so on, the jointer's box was often a two handled affair— probably toted by apprentices. Today's version needn't be as large. Not only is most of our stock already dressed and molded but electricity has made many of our tools more compact.

Usually rectangular in shape, the jointer's box maximizes the use of organized space along the long axis of the box and lid. The lid, long the customary space for saw stowage, will also accept a number of other large flat tools...the framing square for example, or cutting and routing guides. There is space below the drawers and off the bottom for hanging a level.

The construction of the box is relatively straightforward. After cutting the sides, top and bottom to size, one has a choice of how to cut the lid free. The best way is to do the cutting before joining the sides to the top and bottom. Set up the table saw to rip 1-1/2" off the front edge of the sides and top. These will be the mating edges of

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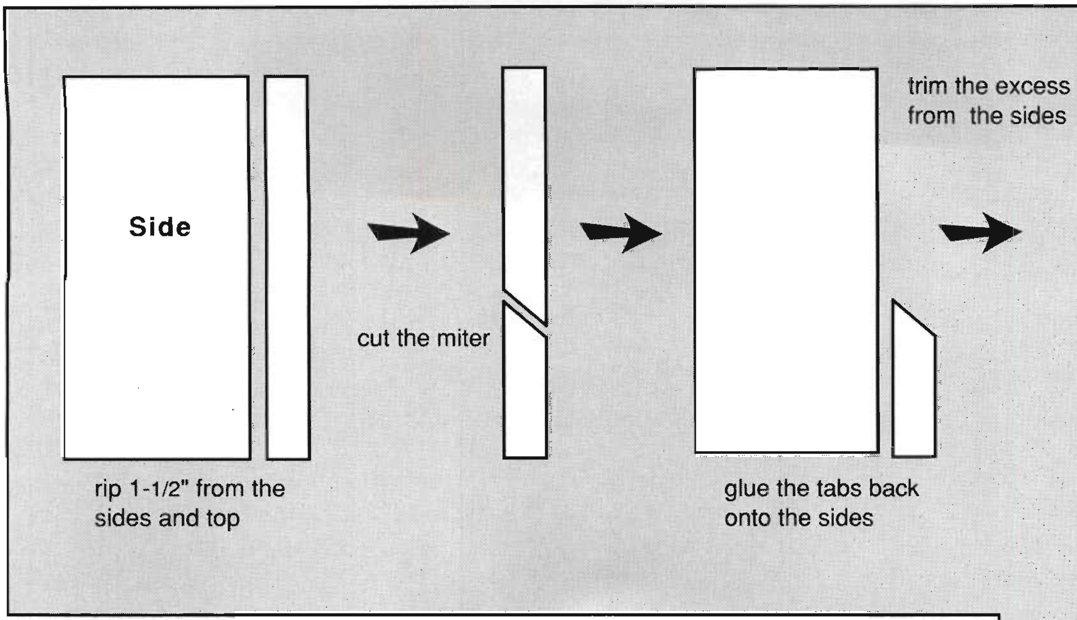
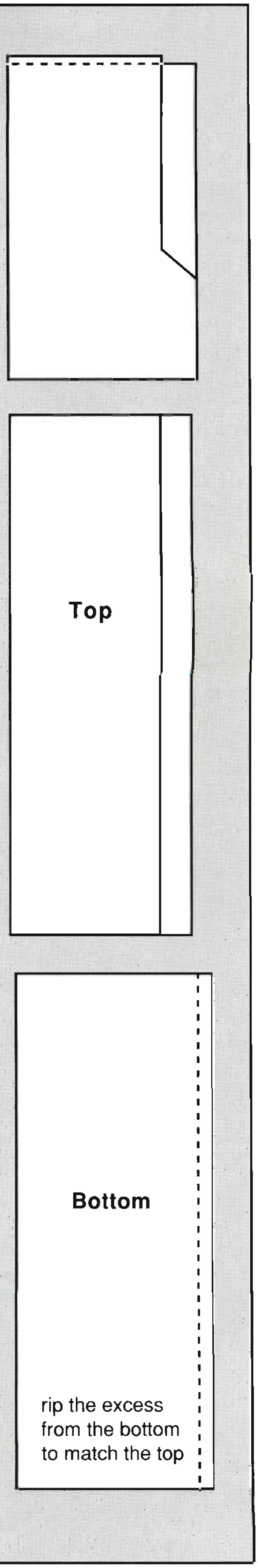
***Joe Petrovich** is an instructor in mill cabinet technology at Hartnell College and owner of Connemara Mills, an exotic hardwood lumberyard in Salinas, California.*

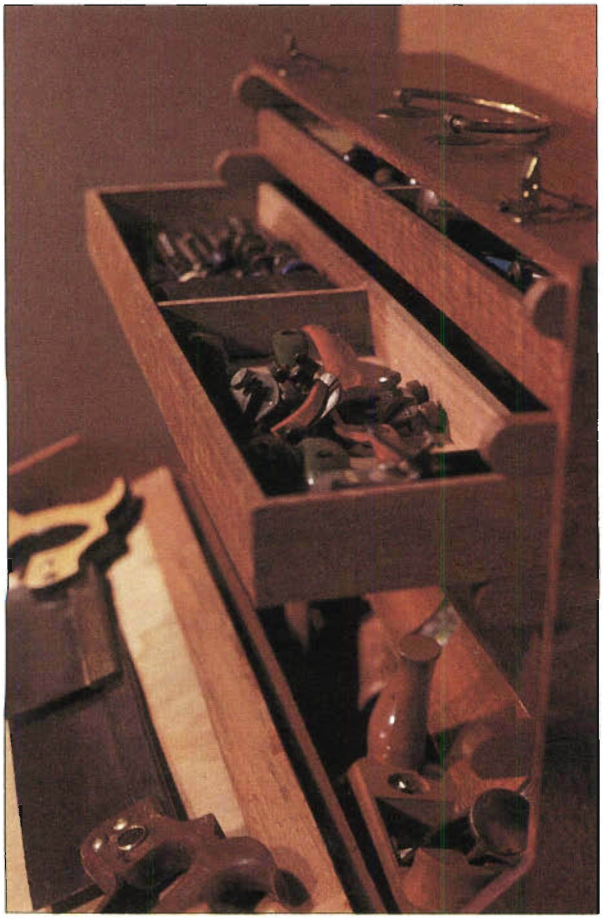




the drop front lid. Orient the 1-1/2" pieces with the sides that you cut them from so you can make the miter cut in the right place for the grain to match up. Tape the two pieces together and cut the miter in both at the same time.

Since the saw kerf took out approximately 1/8" of wood from the sides and top, you'll need to trim this amount from the bottom. Use the two pieces of the top to set the rip fence. Likewise, the miter will have removed approximately 1/8" from the length of the sides of the lid. Using the correctly mated piece as a guide, trim the excess from the side of the box.

The drawer slides extend beyond the opening of the carcase to support the drawers when they are fully opened.



Another way of losing the lid from the box, which avoids all this trimming and fitting is to join the sides top and bottom, attach the front and back panels and then cut the lid loose with a handsaw. This was the procedure in Mr. L's class. He had been a cabinetmaker for twenty years before teaching woodshop and using a handsaw (we weren't allowed power tools) was thoroughly comfortable for him. He talked all through the demonstration, explaining how starting the kerf was the key to a straight and true cut, and that keeping it straight and true was a matter of not binding the blade. He even closed his eyes to show us that it was a matter of "feel". His twenty years of "feel" aside... discounting adolescent hormone levels and allowing for shop winds and tides, the results were, to be kind, mixed.

Depending on what you are after and why you are making the tool box, make your own decision. The hand saw will never be quite as smooth or snug as tablesawing and gluing up. On the other hand, the table saw and glue-up may eventually, depending on your skill and care, show evidence of a glue-up.

Join the four corners of the box with dovetails, locating the tails in the sides and the pins in the top and bottom pieces. The three drawers are also made with dovetails. Cut a 1/4" groove for the drawer bottoms at 1/4" from the bottom edge. Be sure to cut the tails so that this groove ends up in the waste portion and make a stop-groove in the pins of the drawer front and back.

I made the front and back panels using bridle jointed frame and panel construction.

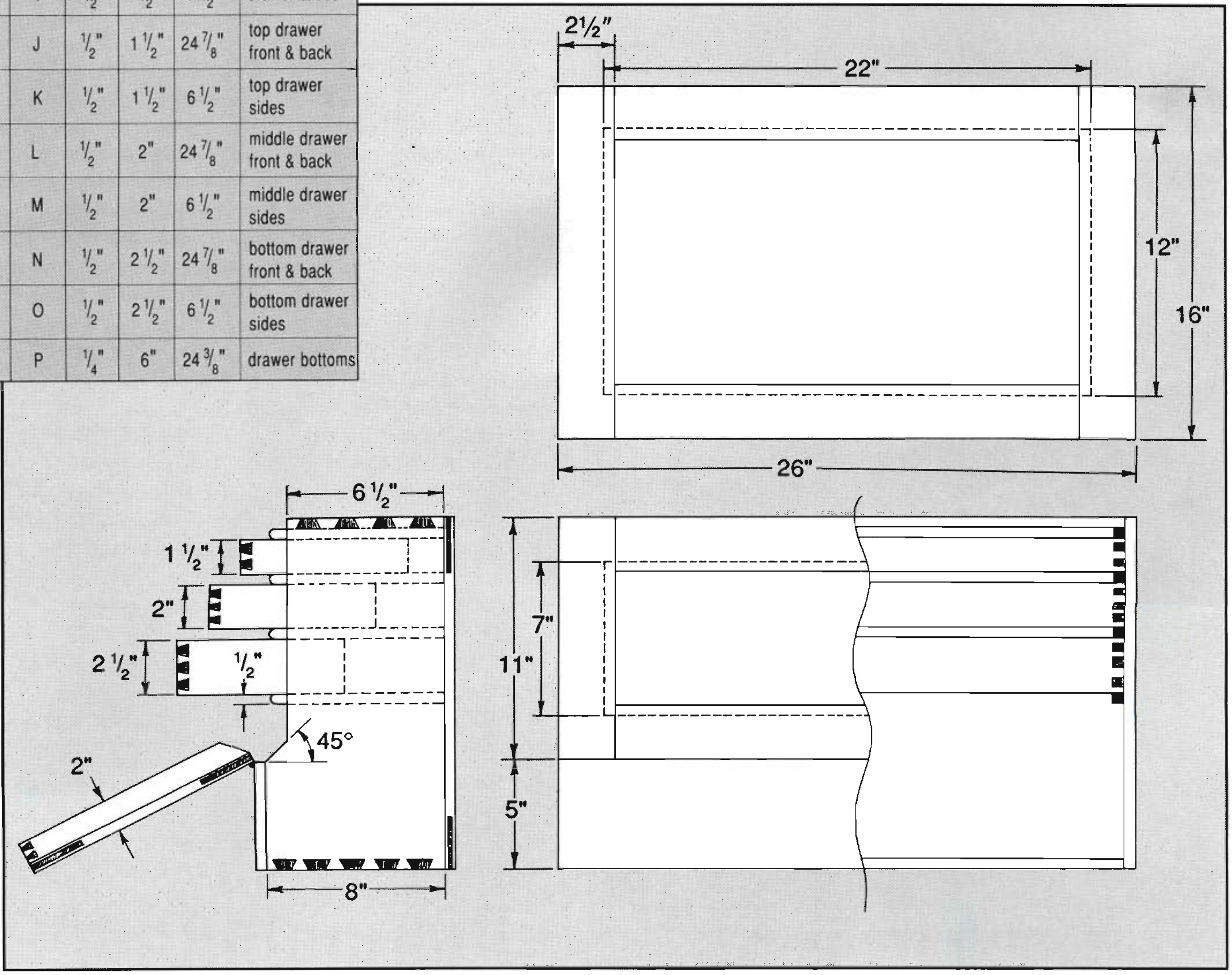
Drawer space requires some consideration. Dividing the internal space of the drawer means that you've limited the length of what can be stored in the drawer. Not dividing the space means that you're inviting the jumble that the box was intended to alleviate. Decide what needs to be fitted into each drawer and allow for some extra space. It is nice to have, though it seldom lasts.

The drawer runners which extend beyond the edge of the box to allow you to view the drawers contents without removing it, ought to be well secured and stout. (Waxing them with paraffin or paste wax smooths the action.)

The final consideration is a handle. It should of course be comfortable and distribute the weight of the box evenly in your hand. There are several commercially available handles made of a leather colored plastic that are quite utilitarian. If you're after something different, visit a second-hand store and look at old suitcases. Quite often one can find an old suitcase with the perfect leather handle for about as much as would have to be paid for a new plastic one.

As fine a teacher as he was, Mr. L neglected to tell us one thing about this project: he should have warned us that once you have a tool box this nice, you tend to want to buy expensive brass and rosewood tools to fill it with.

A Craftsman's Tool Box					
Cutting List					
		Finished Size			
Qty.	Part	T	W	L	Piece
2	A	$\frac{1}{2}$"	8"	26"	top & bottom
2	B	$\frac{1}{2}$"	8"	16"	sides
1	C	$\frac{1}{2}$"	58"	26"	front
4	D	$\frac{1}{2}$"	$2\frac{1}{2}$"	26"	rails
2	E	$\frac{1}{2}$"	$2\frac{1}{2}$"	11"	lid frame stiles
2	F	$\frac{1}{2}$"	$2\frac{1}{2}$"	16"	back frame stiles
1	G	$\frac{1}{2}$"	$6\frac{7}{8}$"	22"	lid panel
1	H	$\frac{1}{2}$"	$11\frac{7}{8}$"	22"	back panel
8	I	$\frac{1}{2}$"	$\frac{1}{2}$"	$7\frac{1}{2}$"	drawer slides
2	J	$\frac{1}{2}$"	$1\frac{1}{2}$"	$24\frac{7}{8}$"	top drawer front & back
2	K	$\frac{1}{2}$"	$1\frac{1}{2}$"	$6\frac{1}{2}$"	top drawer sides
2	L	$\frac{1}{2}$"	2"	$24\frac{7}{8}$"	middle drawer front & back
2	M	$\frac{1}{2}$"	2"	$6\frac{1}{2}$"	middle drawer sides
2	N	$\frac{1}{2}$"	$2\frac{1}{2}$"	$24\frac{7}{8}$"	bottom drawer front & back
2	O	$\frac{1}{2}$"	$2\frac{1}{2}$"	$6\frac{1}{2}$"	bottom drawer sides
3	P	$\frac{1}{4}$"	6"	$24\frac{3}{8}$"	drawer bottoms



Connecticut River Valley Desk on Frame

by Ruth Maharg

If you want to capture the look of an authentic antique, you will enjoy making this Connecticut River Valley desk on frame with cabriole legs and "seashell" carving, typical of the Queen Anne style. American Queen Anne furniture was popular from about 1720 to 1780. Originally made in America circa 1770, this desk and other American pieces simplified the Queen Anne style of England.

Michael Camp, a period furniture artist in Plymouth, Michigan who specializes in 17th and 18th century New England replicas, builds this desk as it was originally made by the craftsmen of the Connecticut River Valley. While cherrywood was the predominant material, pine was used in places where it wouldn't show, such as the drawer sides and bottoms and the back frame pieces. Since plywood didn't exist, pine planks were used for the back of the carcase.

The Lower Carcase

Start your reproduction by making the cabriole legs. Glue up stock and plane to make 2-3/4" square leg blanks (A). For the template, enlarge the squares in Figure 1 and transfer the pattern to a piece of stiff cardboard or thin plywood. Trace the template knee-to-knee onto adjacent sides of each leg blank.

Before cutting out the legs, mount each piece on the lathe and turn the bottom of the spoon foot as shown in the photo above right. Cut the legs out on the band saw by following the pattern on one side, then tape the waste pieces back onto the leg blank to follow the pattern on the other side. The pieces will then fall apart and the legs will be cut roughly to size. Round the corners and sand out the band saw marks.

Ruth Maharg is a freelance writer in Plymouth, Michigan.

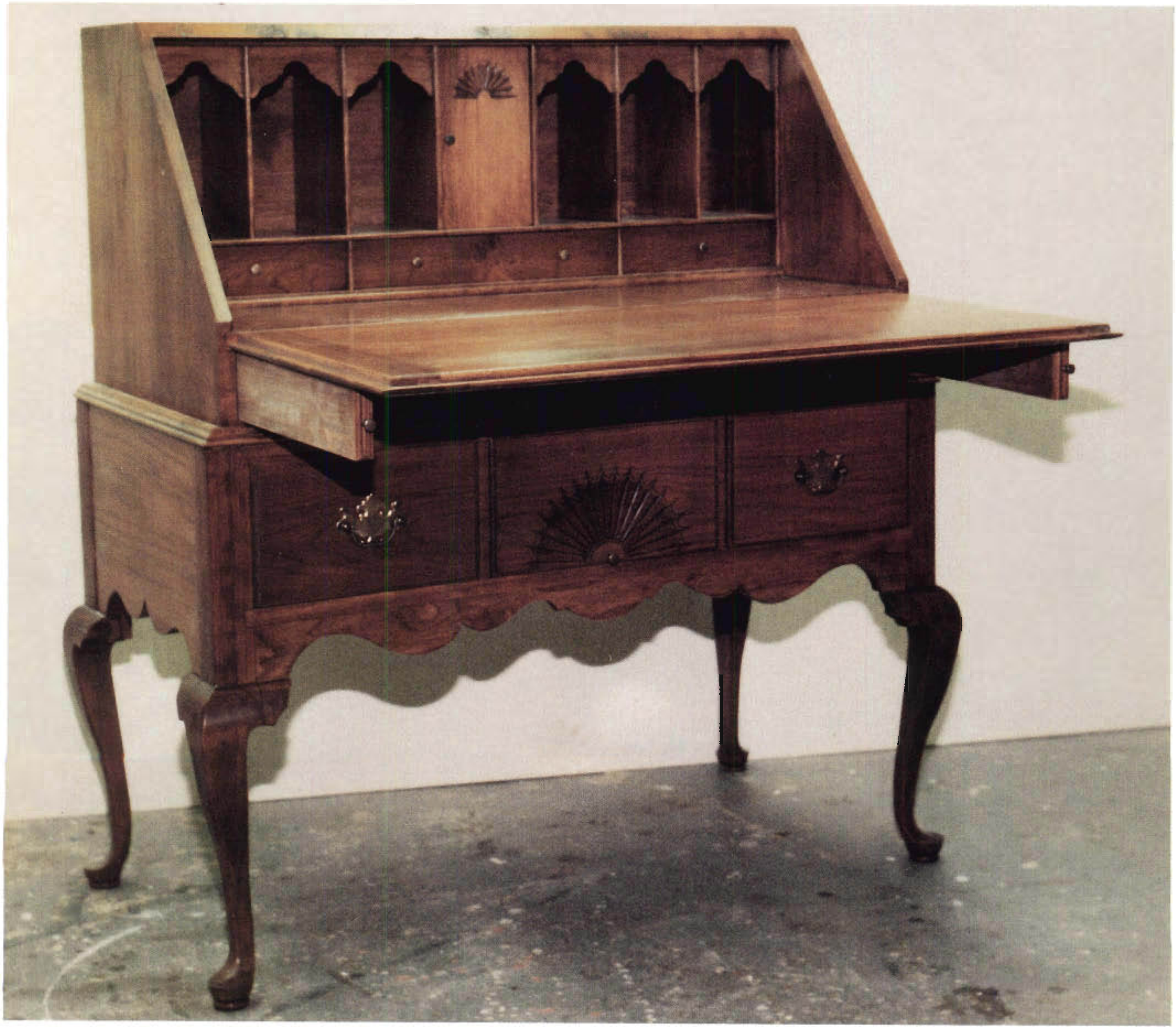
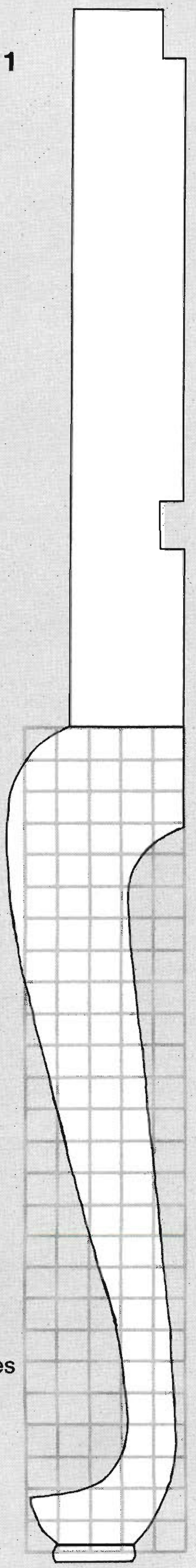
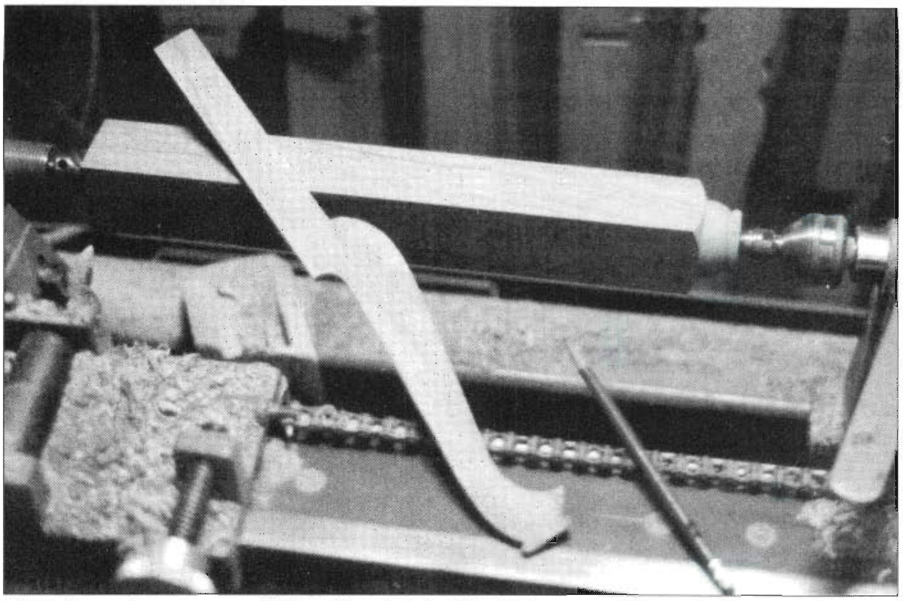


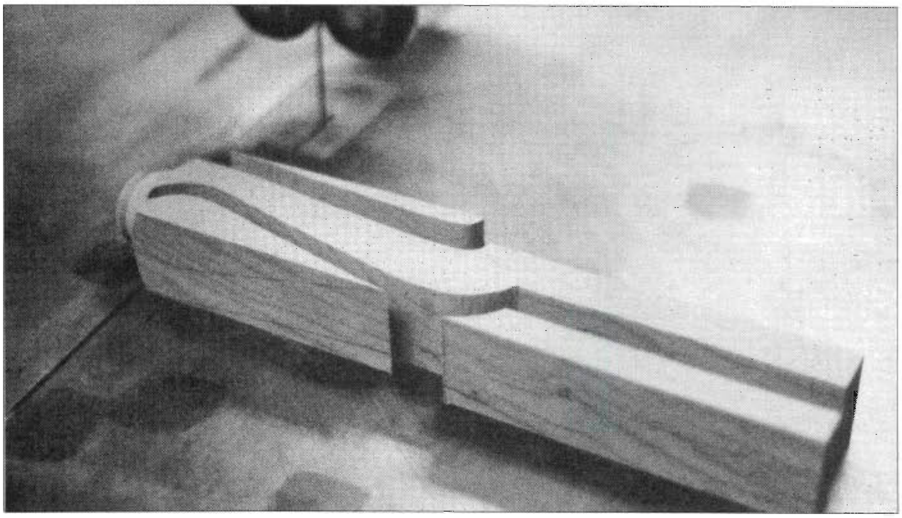
Figure 1

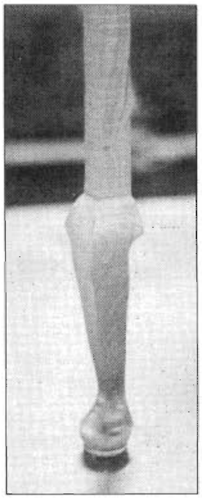




Trace the template onto two adjacent sides of the leg blank, then turn the foot on the lathe.

Cut the leg out on the band saw by following the pattern on one side, then tape the scrap pieces back on, to follow the pattern on the other side.



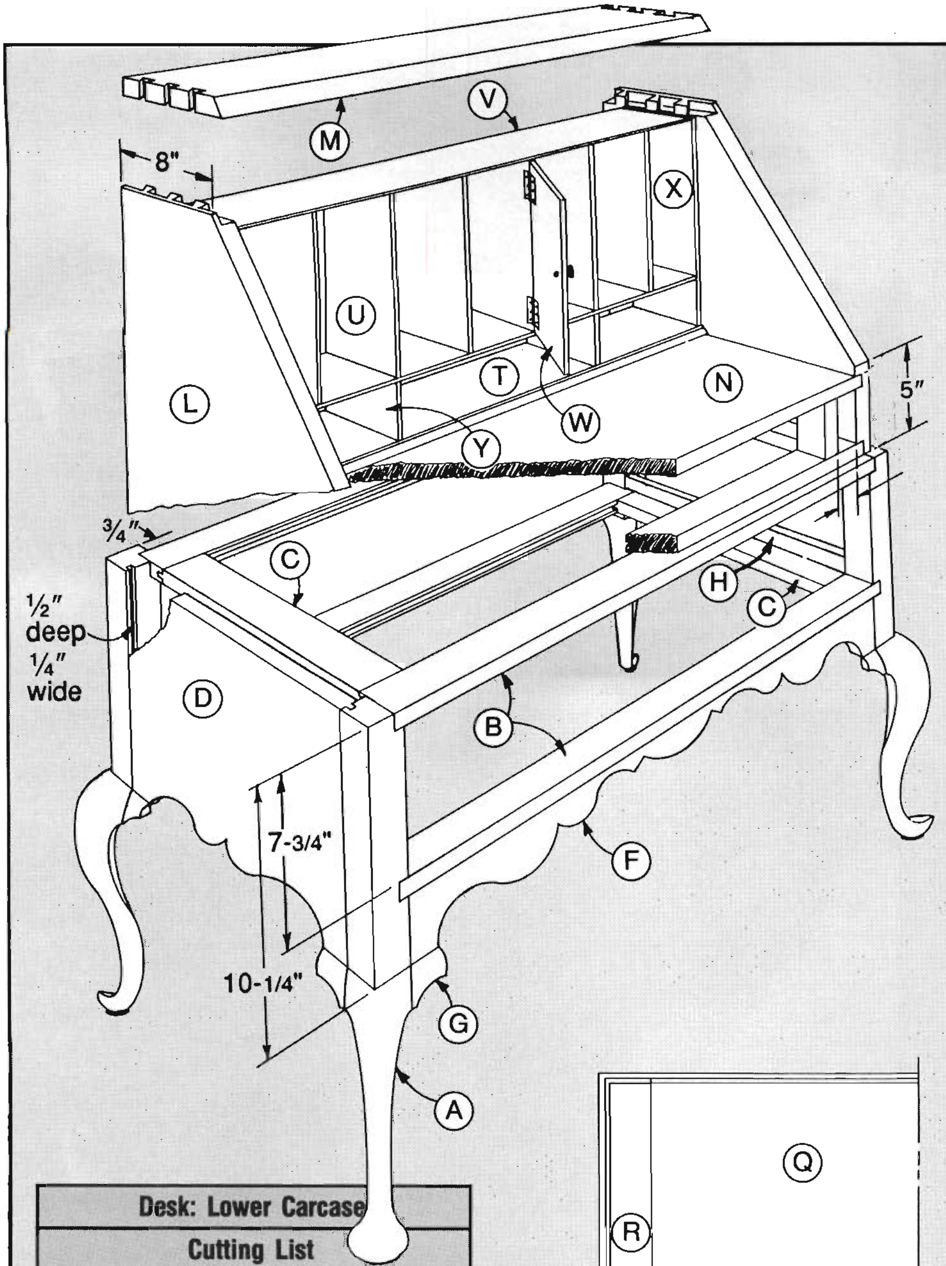


Next, make the three frames (two for the lower case and one for the bottom of the upper case). Cut a 1/2" deep, 1/4" wide groove on center along the inside edge of the frame sides (B and J) to accept 1/2" tongues on the ends of the frame end pieces (C and K). This will give you two frames that are 18" X 34-3/4", and 17-1/4" X 35". Assemble and glue up the frames making sure they dry square, then sand the joints flush so the drawers will ride smoothly on them.

Glue up stock to make panels wide enough for the sides (D). Bandsaw the pattern along the bottom edges, then cut 1/2" long X 1/4" thick tongues centered and running the full width along the ends of the side pieces (see Figure 2). These tongues will fit into grooves cut on the straight portions near the outside edges of the legs.

Mark the legs for left-right, front-back orientation, then set up the table saw fence to reference the square portion of the legs for cutting these grooves. Each leg gets one 1/2" deep X 1/4" wide groove located 1/4" from the outside edge of the straight portion. Study Figure 2 carefully, and think three times before cutting, instead of just twice. Glue up the two side assemblies (each consisting of two legs and a side piece), before notching the legs to accept the frames.

The frame connects the two side assem-



Desk: Upper Carcase					
Cutting List					
		Finished Size			
Qty.	**Part**	**T**	**W**	**L**	**Piece**
2	J	¾″	2″	35″	upper frame sides
2	K	¾″	2″	14¼″	upper frame ends
2	L	¾″	18⅛″	18″	upper sides
1	M	¾″	*8½″	35¼″	top
1	N	¾″	17¼″	35″	inside desk surface
2	O	¾″	2″	3″	dividers
2	P	¾″	3″	†16″	lid supports
1	Q	¾″	16″	32″	lid
2	R	¾″	2″	16″	lid end pieces
1	S	¾″	16½″	34¼″	back

*Size is approximate; cut to fit.
†15½″ pine faced with ½″ cherry.

Desk: Lower Carcase					
Cutting List					
		Finished Size			
Qty.	**Part**	**T**	**W**	**L**	**Piece**
4	A	2¾″	2¾″	24⅝″	leg blanks
4	B	¾″	2″	34¾″	lower frame sides
4	C	¾″	2″	15″	lower frame ends
2	D	¾″	10¼″	16¼″	sides
1	E	¾″	10¼″	34″	back
1	F	¾″	*2 13/16″	*34″	apron
6	G	1½″	1½″	2″	knee brackets
2	H	¾″	1″	15″	drawer guides
1	I	¾″	6⅝″	34″	back

*Size is approximate; cut to fit.

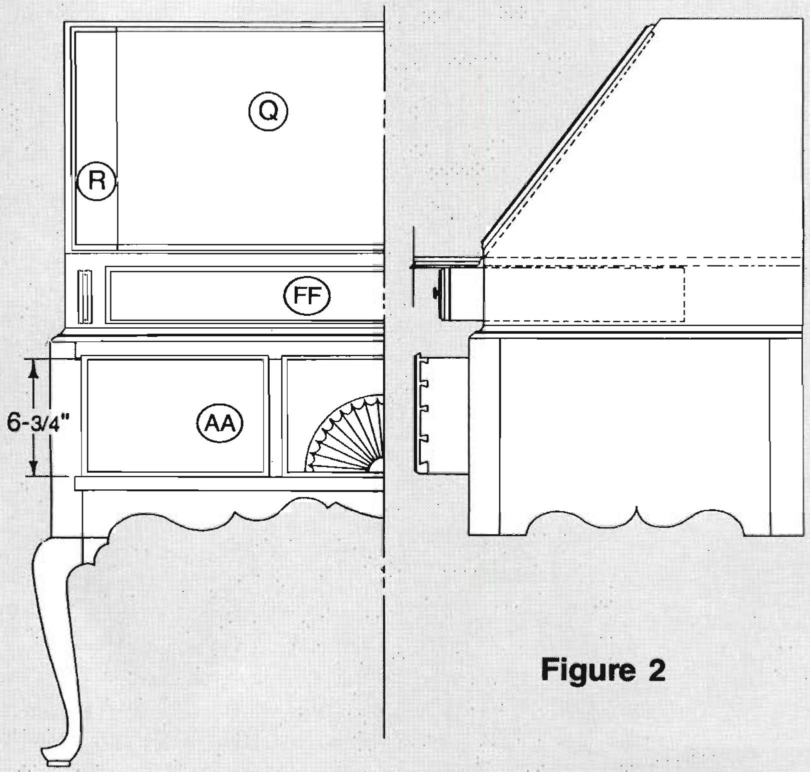
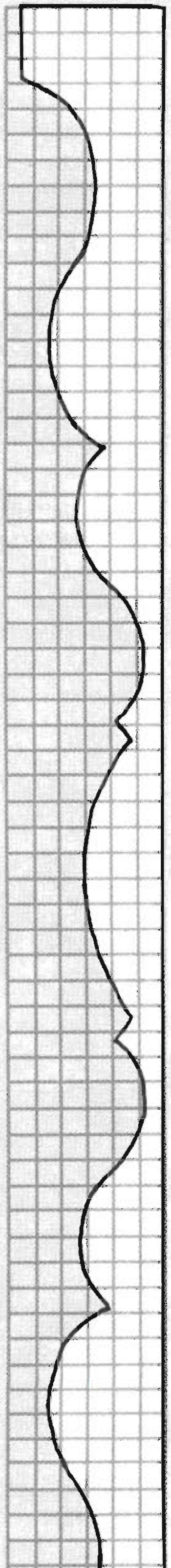


Figure 2

Figure 3



½″ squares

blies to make up the lower carcase. The top frame rests in a 3/8" deep X 3/4" wide rabbet in the tops of the legs, and the other frame fits into a dado of the same size cut into the legs at 7-3/4" from the top. The frames should stop 3/4" away from the back edge of the back legs. This 3/4" setback is for the pine planks that make up the back of the carcase (E).

Dry fit the dado joints; they should be just tight enough to hold together without glue or clamps. Glue and apply bar clamps parallel with the frames. If the case isn't square, run bar clamps diagonally and pull it square.

Next, cut the front apron (F) for a very snug fit between the front legs. Enlarge the squares in Figure 3 to make the pattern for trimming the bottom edge of this piece.

To make the knee brackets (G), cut small blocks of wood to the size shown in the cutting list. Mark each block for its specific location then hold each in place and trace the curve of the knee onto the side of the block and band saw that profile. Hold the block in place again to mark the bracket shape which joins the lines of the apron to the curve behind the knee. After bandsawing, glue in place and sand flush.

The last step in making the lower carcase is to cut and fit two drawer guides (H) in the spaces between the front and back legs. Line the guides up flush with the inside surfaces of the legs to help the drawer go in straight. Glue in place.

The Upper Carcase

The best way to make the panels for the upper sides, the inside desk surface, and the lid is to glue up boards to make one panel about 9' long, and cut the pieces from it. Cut the two upper side pieces (L) slightly oversize, choose a right and a left and join the two together with double-sided tape on the inside surfaces. Square up the pieces to the final size and cut the slope by making a mark 8" from the back on the top edge, and 5" from the bottom on the front edge. Draw a straight line connecting these two points, and follow this line to cut off the front corners.

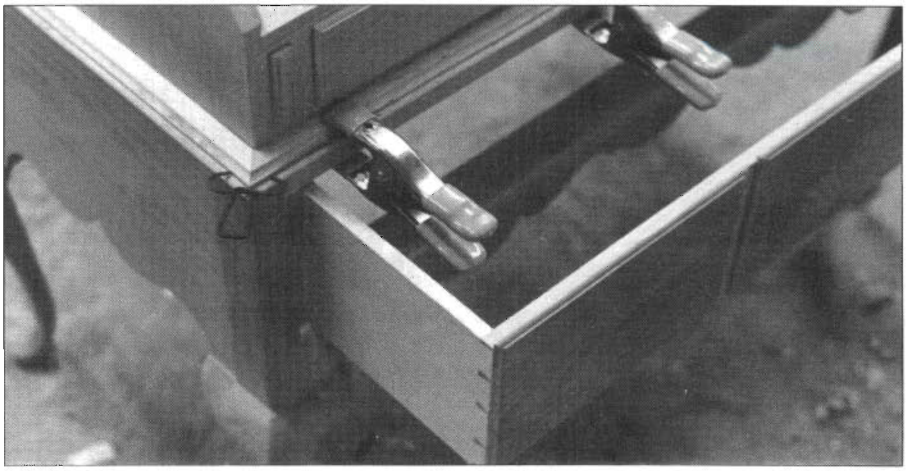
Now separate the two side pieces and cut a 3/8" X 3/4" rabbet along the bottom edge and a dado, that is the same size, whose uppermost edge is located 4-1/2" from the bottom.

Set up your table saw to rip the front edge of the top (M) to match the slope of the sides. The top is joined to the sides with half-blind dovetails; mark and cut the tails in the top and use the top to mark the pins in the sides. (See the article on page 24) for more information on how to cut this joint.) Assemble the upper carcase with the inside desk surface (N) in the dado, and the left over frame in the rabbet.

Permanently attach the upper case to the lower case by running #8 drywall screws with glue on the ends through the lower frame into the upper frame. The back edges should be flush, and the sides of the upper case should be centered on the lower case. Trim with routed molding (1-1/8" wide X 3/4" thick) between the upper and lower carcases. Miter the two forward corners of the moulding and glue and clamp with spring clamps.

While the clamps are still in place, add the two dividers (O) that separate the drawer from the two lid supports (P). Cut the blocks to length and glue in place. Prepare the lid supports by gluing pieces

Use spring clamps to apply molding around the bottom of the upper carcase.



of 1/2" X 3/4" X 3" cherry onto the front ends of the pine slides. Glue stop blocks on the back of the frame to stop the lid supports about 3/8" proud of the front of the case.

To make the lid, cut the main lid section (Q) from the large panel and mill a 1/4" thick, 1/2" long tongue on center along the ends. This tongue is to fit into a corresponding groove in the two lid end pieces (R).

The Pigeonholes

Mill some cherrywood to 1/4" thickness for the upper interior pieces. The bottom (T) is a little thicker and wider than the partitions, and has a routed profile on its front edge. The complete pigeonhole compartment is put together just with glued butt joints, so you'll need some help during assembly. The best approach is to first glue the secondary partitions (U) in place between the middle divider and the top (both labeled V). The partitions have 4-5/8" between them with the door (W) cut to fit whatever space is left in the center. Cut scrapwood spacers for the top and bottom of each pigeonhole to hold the partitions in place during assembly. Then apply the ends (X) and install the primary partitions (Y) between the bottom and the middle divider.

Desk: Pigeonhole Compartment

Cutting List

Qty.	Part	Finished Size T	W	L	Piece
1	T	½"	7"	34¼"	bottom
6	U	¼"	6½"	9¹⁄₁₆"	secondary partitions
2	V	¼"	6½"	33¾"	divider & top
1	W	¼"	*4³⁄₁₆"	*9"	door
2	X	¼"	6½"	12¹⁄₁₆"	ends
2	Y	¼"	6½"	2½"	primary partitions
6	Z	¼"	2½"	4⅝"	pigeonhole arches

*Size is approximate; cut to fit.

Gluing this pigeonhole compartment in the upper carcase will give it its strength. Make the template for the pigeonhole arches (Z) as shown in Figure 4, cut them out and glue in place. Cut the door to fit the center compartment and install after carving the shell pattern. Then attach the upper carcase back (S).

Drawers

The drawers are assembled with half-blind dovetails at the front and through dovetails at the back. The backs are 7/8" shorter than the sides so only the sides will ride on the frames. Bevel three edges of the pine drawer bottoms down to a thickness just shy of 1/4" on the edges. Cut a 1/4" dado 3/4" from the bottom edge of the drawer sides and fronts, slide the bottoms into this groove, and drive a single nail through the bottom into the back of each drawer (see figure 5).

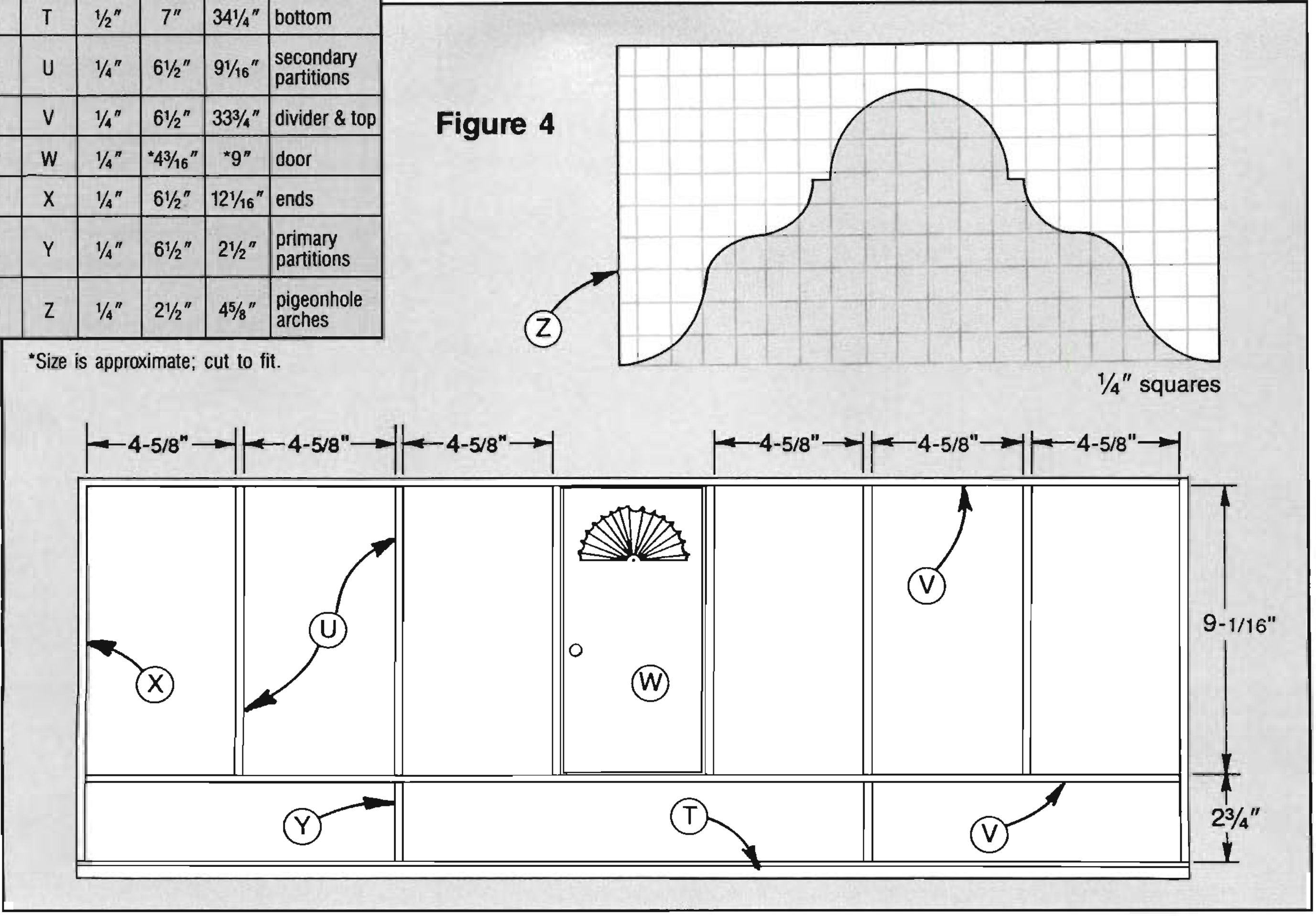
Before assembling the lower drawer, set up to mill two 1/2" wide, 3/8" deep dadoes in the bottom drawer front (AA) so it will look like three drawers. Run a "quarter round connected to a fillet" around the three sections. *(This is where it would be nice to have one of Graham Blackburn's molding planes.-Editor.)* Trim the middle drawer front (EE), the ends of the lid supports (P), and the edges of the lid with this same edge detail. The lid will need a rabbet on the opposite surface that runs along three edges. The middle and bottom drawer fronts should have a 3/8" X 3/8" rabbet along their top edge.

The Final Trim

Carving this stylized version of a shell on the drawer front and door (W) is not too difficult. Figure 6 is the pattern for the drawer. A smaller, simpler version is repeated on the door.

Find the bottom center of the drawer front and draw arcs with a compass to lay out the shell. There should be an odd number of equal rays, and a ray, not a line, in the center. Carve the outlines with a

Figure 4



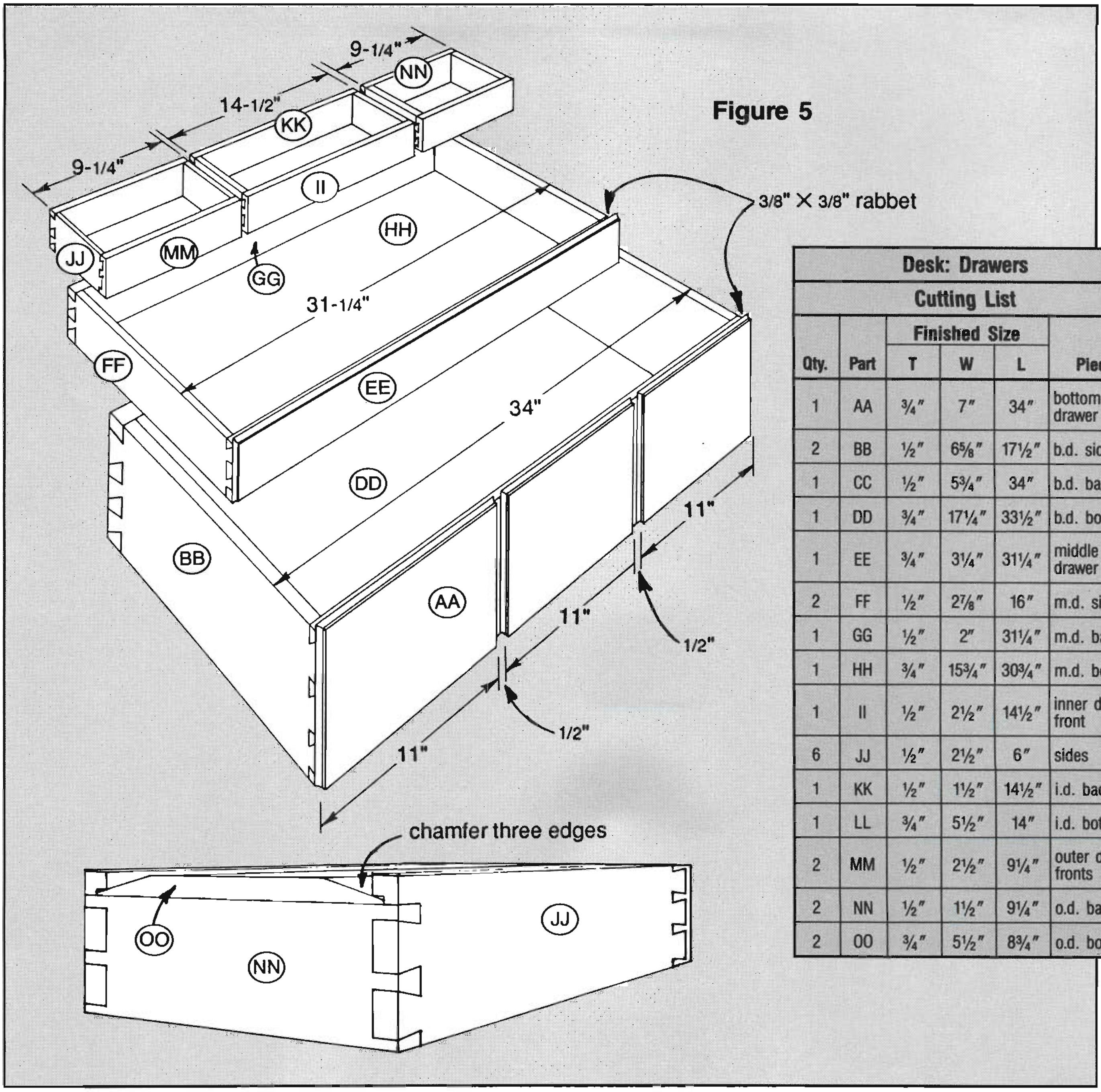


Figure 5

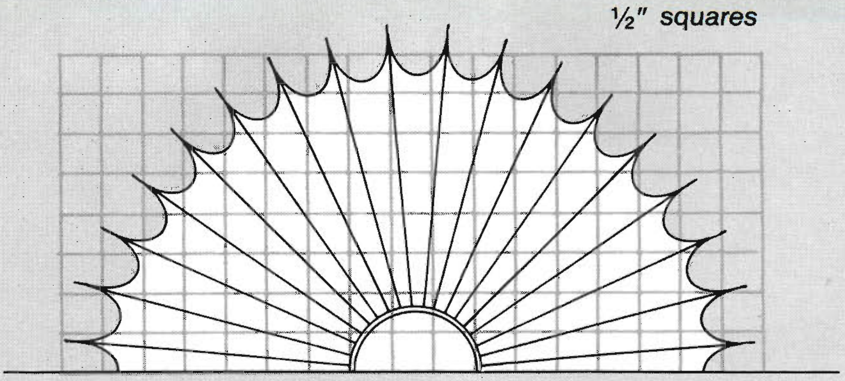
Desk: Drawers					
Cutting List					
		Finished Size			
Qty.	Part	T	W	L	Piece
1	AA	¾″	7″	34″	bottom drawer front
2	BB	½″	6⅝″	17½″	b.d. sides
1	CC	½″	5¾″	34″	b.d. back
1	DD	¾″	17¼″	33½″	b.d. bottom
1	EE	¾″	3¼″	31¼″	middle drawer front
2	FF	½″	2⅞″	16″	m.d. sides
1	GG	½″	2″	31¼″	m.d. back
1	HH	¾″	15¾″	30¾″	m.d. bottom
1	II	½″	2½″	14½″	inner drawer front
6	JJ	½″	2½″	6″	sides
1	KK	½″	1½″	14½″	i.d. back
1	LL	¾″	5½″	14″	i.d. bottom
2	MM	½″	2½″	9¼″	outer drawer fronts
2	NN	½″	1½″	9¼″	o.d. backs
2	OO	¾″	5½″	8¾″	o.d. bottoms

V-tool and then round down to the lines with a skew chisel.

Before staining, make sure that everything is sanded to the same grit. Stain the pine with an oil base stain to match the cherry. When it's dry, apply a finish coat until the grain is filled. Smooth with steel wool and use a glaze for highlighting. Apply a second finish coat, and when that coat's dry, rub with pumice and rottenstone.

Install the knobs and hardware. Recess the hinges flush with the writing surface. The finished desk will add the warmth and beauty of early America to your home. **PW**

Figure 6



Snakewood

This modern snakewood cello bow is the work of Paul Siefried of Los Angeles. Other materials are ivory, gold and leather.

by S. Reed Poverny

By definition, "exotic" woods are those with a striking appearance that have been introduced from abroad. Snakewood could be called *the* exotic among the exotics.

That this species is striking in appearance goes without saying, and opinions differ as to just what snakewood resembles. "Letterwood," "leopard wood," "speckled wood," and "tortoiseshell wood" are all common names in the trade. (This could be due as much to the range of its pattern as to individual interpretation.)

The rarity and appeal of snakewood is historic. Natives of what is today called Guayana, Surinam, and French Guiana once fashioned it into hunting bows. When Europeans began settling in the region in the 1600's, snakewood became an important item of export. A favorite among the European gentry, snakewood's natural elegance was used to effect in parasol handles, walking canes, and violin bows. Gathering the wood for export was a painstaking task even then.

An Uncommon Animal

For good reason, much of the early snakewood exports were in the form of downed logs which had had their sapwood removed by insects and decay. The heartwood is the only part of the tree that is valuable. It forms slowly, so that a 15" diameter log may have only 1" - 4" of heartwood at the center, which means that the bulk of the sapwood must be hewed off in the forest with an ax. As it is, a 4" diameter log of snakewood heartwood is quite

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***S. Reed Poverny** is a wood researcher, woodworker and photographer. His work in a specialty lumber store has given him first-hand knowledge of domestic and exotic woods.*

a load to carry. One of the densest woods known, snakewood even surpasses lignum vitae in weight. Since the trees grow in densely forested areas which are inaccessible to vehicles, the logs are carried out of the jungle on foot. Sparsely distributed in the forest, snakewood trees can reach heights of 80' and diameters of over 3' at the base. Their smooth bark is filled with a viscous latex. Bushmen who hunt for snakewood claim they can walk for ten miles and not spot a single tree. Not all snakewood logs have the prized "snake" figure. Some logs, called "bastard" logs by natives, are plain inside. There is no way to know which trees are figured and which are not until a tree is felled and the sapwood stripped away.

General Description

Usually left behind in the South American jungle, the sapwood of snakewood is plain and blond. The color of the heartwood is red, like Cuban mahogany. Over time, the heartwood deepens in color to brown. Against this darker background, the black markings become less distinct.

Like other woods, snakewood can have a fine black veining that runs in a typical "wood grain" pattern. The background color is subtly marbled at times. Rarely does the "snake" pattern appear throughout the log; more often it travels in and out at different levels and areas. The markings can be spots of all sizes, or squiggles sketched across the grain, spaced closely or far apart. Sometimes the markings are dark and definite, other times so faded they are barely distinguishable. There are theories as to what causes the peculiar pattern in these trees, but no scientific conclusion has been reached.

At about 80 pounds per cubic foot, snakewood has a tighter grain than ebony, so close the pores can hardly be seen. Oily like cocobolo, it is a close relative to bloodwood and has a similar faint cherry tobacco fragrance.

Working Properties

Overall, snakewood works beautifully, but its tendency to develop hairline checks along the grain can be maddening. Due to its terrific density, snakewood is not fully dry even after years of air seasoning. As fresh surfaces are opened to the air, moisture escapes and the wood splits. It was reported to have checked easily while being arched into the form of the cello bow shown on the opposite page. Though the favorite for this purpose, pernambuco, is a stiffer wood for less weight, snakewood's rich look continues to beckon bow makers.

Turners enthuse about snakewood's capacity for taking extremely fine detail on the lathe. From the very outset it begins to look polished, and shines sumptuously under fine sandpaper.

Major splits and flaws are common fare in log sections of snakewood, so obtaining a large piece is difficult. The wood is most often used where limited dimension is not an issue, such as with knife and gun grips, jewelry, and inlay work. In most cases, some repair work is needed before beginning. Knifemakers have found that the "super" or cyanoacrylate glues are effective in filling and hiding hairline checks. More extensive cracks may require filling with a mixture of epoxy and sawdust. As with goncalo alves and other oily woods, it is best to rub snakewood down with acetone or a similar solvent before gluing. After this, any yellow woodworking glue should work fine.

Finishing

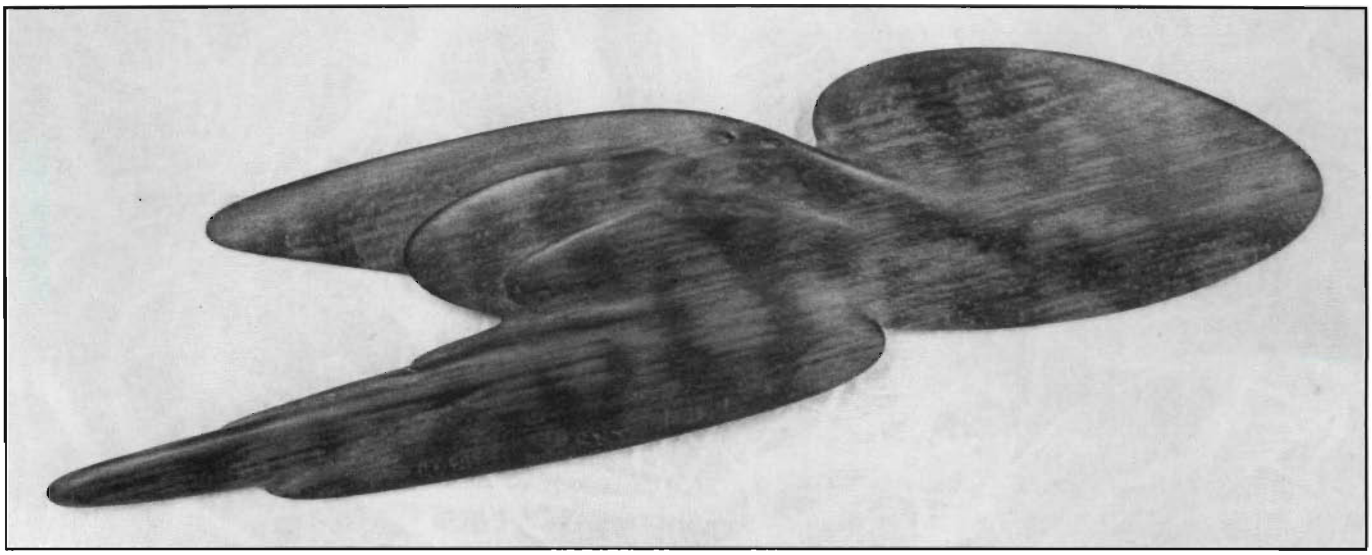
Having to apply any finish at all to a wood this silky to the touch seems a shame. A coat of paste wax is prudent to guard against checking. An unconventional but effective finish for snakewood is Brasso ®, which contains a fine polishing compound. For smaller pieces, cyanoacrylate glue can also be applied as a finish, and then rubbed out like lacquer. Should you still choose to brave going without a finish, buff the surface briskly with oily wood shavings to achieve a marvelous sheen.

Availability

As a general rule, specialty hardwood outlets do not stock snakewood, but it can be obtained through mail-order houses. What is available has usually been dimensioned into smaller pieces. The considerable waste involved in dodging flaws and going for prime figure is part of the reason snakewood demands a price equal to pink ivory, the rarest commercial wood. Like ebony and kingwood, snakewood is sold by weight. Logs of solid heartwood 3"- 8" in diameter and over 4' long are also sometimes offered for sale. By all means be judicious, since figure and quality are unpredictable in this species.

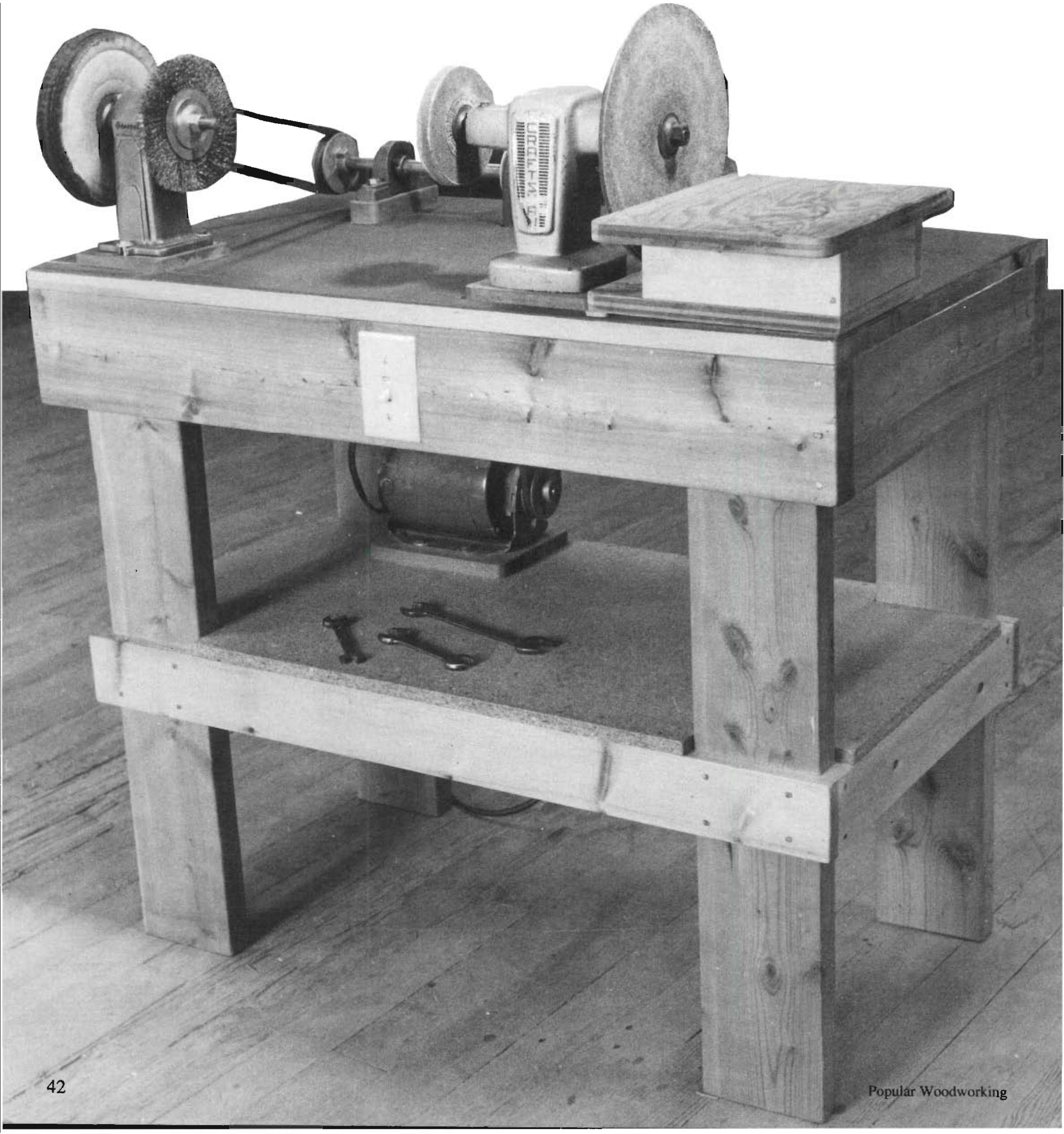
Whether you see it as a snake, leopard, or tortoise, this is one exotic creature from the bush well worth domesticating. PW

Evocative snakewood naturally lends itself to jewelry and sculpture, as in this snakewood netsuke by the author. Length 4".



Project for the Shop

Build Your Own Power



Utility Bench

by Owen S. Cecil

What power bench tool disk sands, grinds, brushes, buffs, and costs less then $200? None that I could find in the tool catalogs. That's why I built this power utility bench to perform a multitude of common jobs. It's one of the most frequently used pieces of power equipment in my shop.

The main feature I was looking for was a good, inexpensive disk sander. I had tried a 10″ disk attachment on my radial arm saw, but the motor speed was too high resulting in burned wood and clogged sandpaper. Because I occasionally need buffing and wire wheels for other jobs, I decided to build a one-stop, four-in-one rig that would give me variable speed and quick wheel changes. This utility bench fulfills those requirements, and is low cost to boot.

The basic "building block" of the utility bench is a simple buffing and polishing head, sometimes just called a "tool head." My favorite is a large unit from Sears Roebuck. Other tool catalogs, such as Woodcraft, also list polishing heads. I recently purchased one directly from General Hardware in Fredonia, Wisconsin.

The tool head is a small cast iron pedestal equipped with a ⅝″ diameter shaft set in babbit bushings. The ends of the shaft are turned down and threaded for ½″ accessory wheels. A V-belt pulley locks onto the center of the shaft for power supplied by a ⅓ horsepower, 1725 rpm motor equipped with a 3″ diameter, type "A" V-pulley. The heads will take just about any type of power wheel accessory you may wish to bolt on.

I mounted two tool heads and positioned them so that the wheels would overhang the front edge of the bench. It's also handy to have one extend over the end of the bench top to facilitate work on irregularly shaped objects. Allow space for a disk sander table by positioning the second tool head in from the end of the bench.

Drive for the tool heads comes from a motor mounted on a shelf beneath the bench top. Placing the motor beneath the table keeps it out of the way and somewhat protected from heavy dust and grit accumulation. The V-belt brings power up to a ¾ inch-diameter intermediate drive shaft mounted in two ball bearing pillow blocks, which in turn drives the tool heads via belts of appropriate length. If you plan on using only one polishing head, you needn't bother with the pillow blocks and shaft—simply run a belt directly from the motor to the head.

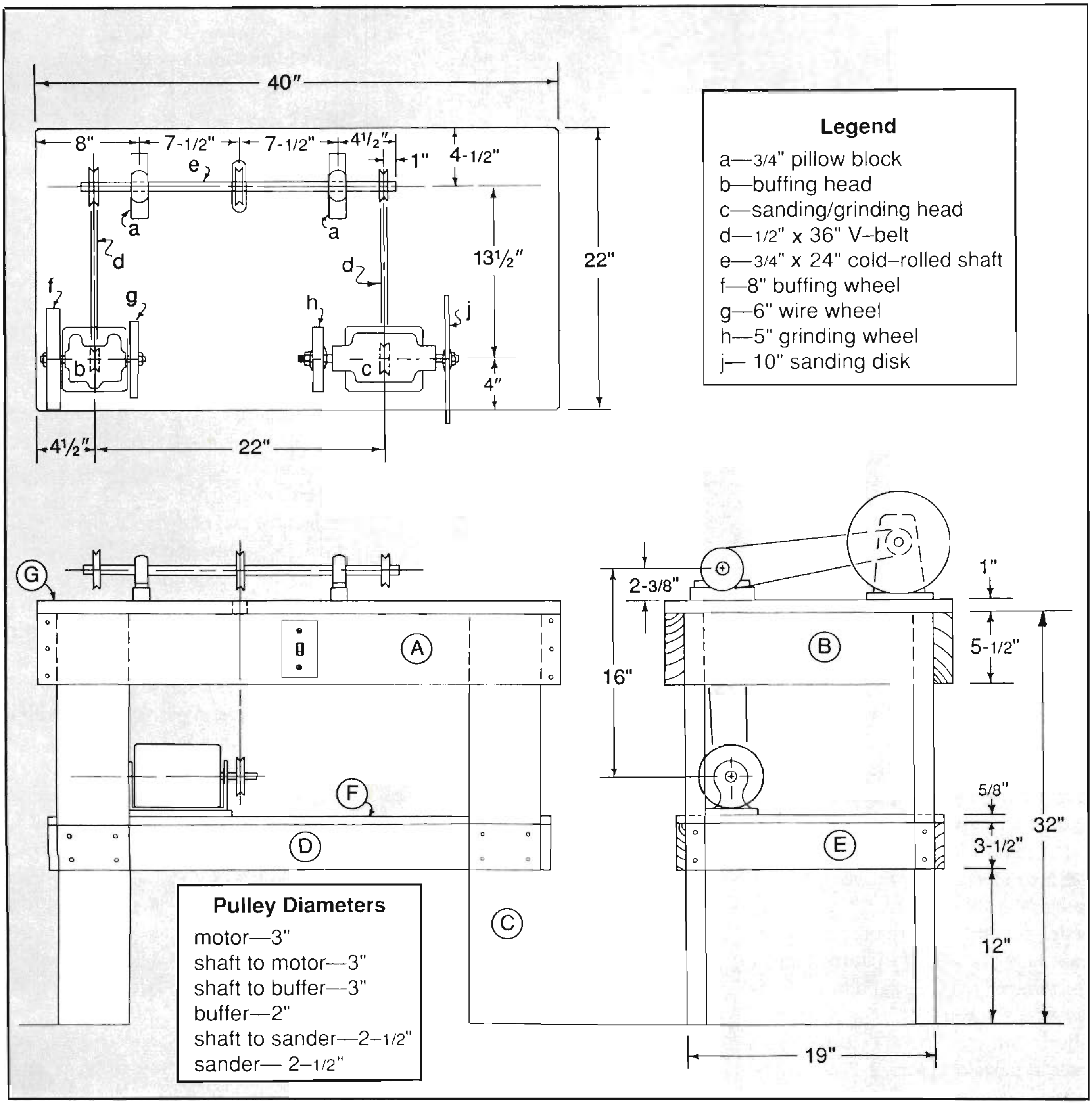
I considered using a motor with a double-ended shaft and driving the two heads directly off the motor. This set up would have avoided the intermediate drive shaft/pillow block arrangement, but would have placed the polishing heads too close together for the work I intended to do. The same intermediate power shaft concept used on a longer bench would allow power takeoff for three or more tool heads, or even other equipment such as a small lathe or table saw.

Start the project by collecting the mechanical and electrical components. I used a secondhand ⅓ horsepower furnace blower motor which I picked up at a motor repair shop for $30. The motor is fine for light duty work, but if I were to start again I would go with a ½ horsepower because the intermediate drive shaft and pillow blocks use up some power through friction loss.

The used motor on my unit turns over at 1725 rpm and draws 6.4 amps. Using the pulleys indicated, the disk sander turns at 1725 rpm and the buffer/wire wheel at 2588 rpm. These speeds seem to be about perfect for the operations I have performed so far (sanding wood and polishing steel).

I used a 24″ length rod of ¾″ diameter cold rolled steel for the drive shaft at the rear of the bench top. You should be able to find this at any machine shop. A ½″ rod would be entirely adequate, provided you can find pillow blocks of that size. The pillow blocks, in any size, may well be the hardest item to find in this project. Ask motor shops, bearing suppliers, or write to the manufacturers suggested in the sidebar. Pulleys and V-belts are available from most hardware stores. Be sure to get pulleys to match the shaft diameters. Along with the motor, you'll need a few feet of #14-gauge 3-wire electrical cord, a three-prong plug and an ordinary light switch and face plate for on/off control.

Owen Cecil is a woodworker in Manistee, Michigan.



Legend

a—3/4" pillow block
b—buffing head
c—sanding/grinding head
d—1/2" x 36" V-belt
e—3/4" x 24" cold-rolled shaft
f—8" buffing wheel
g—6" wire wheel
h—5" grinding wheel
j— 10" sanding disk

Pulley Diameters

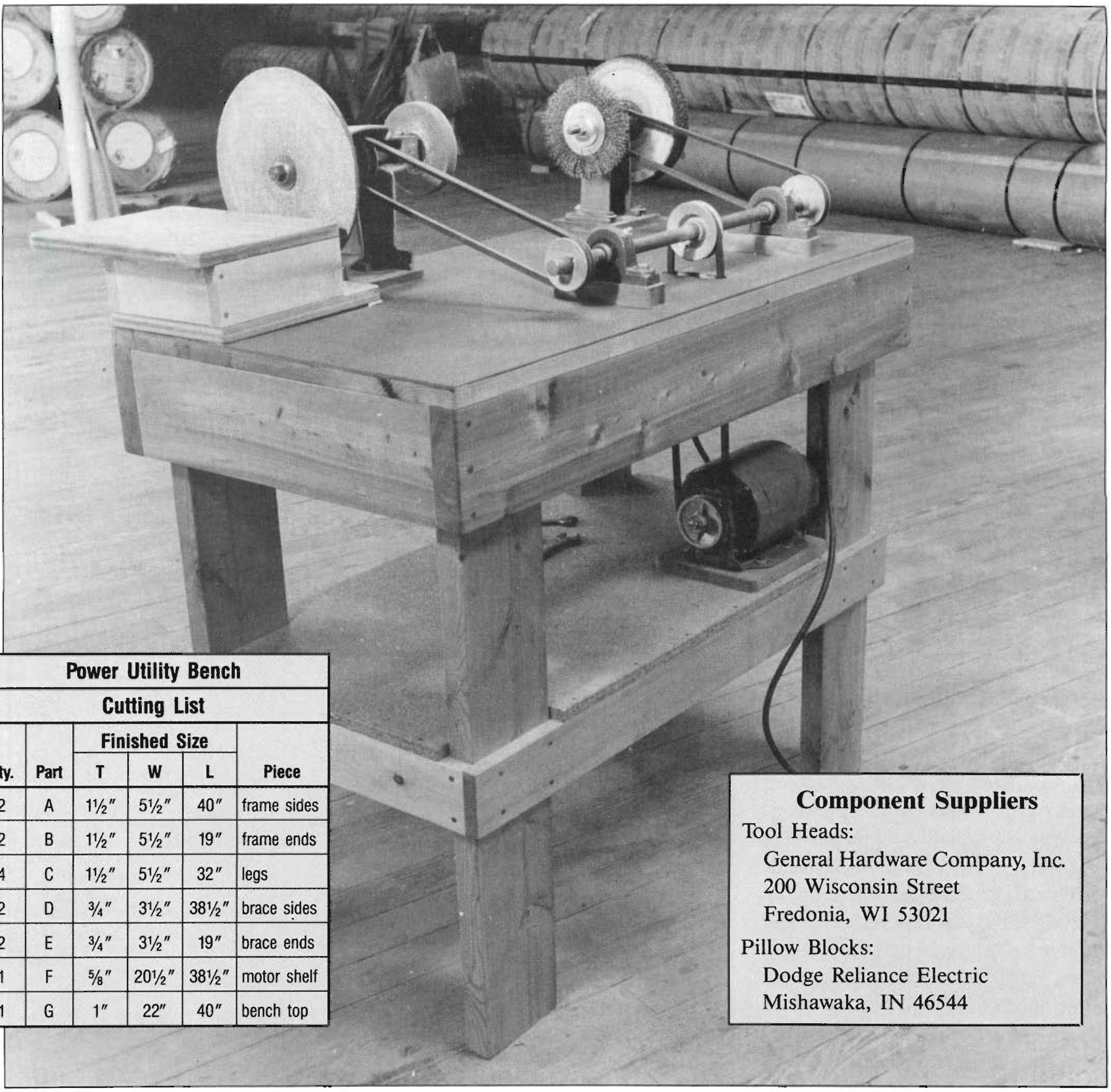
motor—3"
shaft to motor—3"
shaft to buffer—3"
buffer—2"
shaft to sander—2-1/2"
sander— 2-1/2"

Build the bench frame from good grade Douglas fir 2 x 6's. Don't use the spruce/pine/fir stud-grade wood. The dimensional changes that most of this cheap stuff undergoes with temperature and moisture fluctuations may cause the bench top to split, as happened with my unit. Douglas fir is much more stable.

I glued and nailed the four top frame members (A and B) together, then glued and screwed the legs (C) from the inside. 1 x 4 pine makes a suitable perimeter leg brace (D and E) and also serves as a support for the motor shelf (F). Use ¾" plywood for the bench top (G), or glue up ¾" or 1" boards you may have laying around the shop. Cut the top to approximate size, glue and nail to the frame then trim to exact size with a sharp plane.

Particle board (⅝" or ¾" thickness) is satisfactory for the motor shelf. I painted the bench top and varnished the rest of it.

Before you start to drill holes in the bench top for the accessories, carefully lay out everything to make sure the arrangement fits together and that bolt holes will not be at inaccessible locations near the edges. I mounted the tool heads as close as possible to the front edge of the bench top to minimize interference from the bench when holding large objects against the wheels. To protect the bench top from damage and more importantly to give greater clearance for buffing and wire brushing large objects, I mounted the tool heads



Power Utility Bench					
Cutting List					
		Finished Size			
Qty.	Part	T	W	L	Piece
2	A	1½″	5½″	40″	frame sides
2	B	1½″	5½″	19″	frame ends
4	C	1½″	5½″	32″	legs
2	D	¾″	3½″	38½″	brace sides
2	E	¾″	3½″	19″	brace ends
1	F	⅝″	20½″	38½″	motor shelf
1	G	1″	22″	40″	bench top

Component Suppliers

Tool Heads:
General Hardware Company, Inc.
200 Wisconsin Street
Fredonia, WI 53021

Pillow Blocks:
Dodge Reliance Electric
Mishawaka, IN 46544

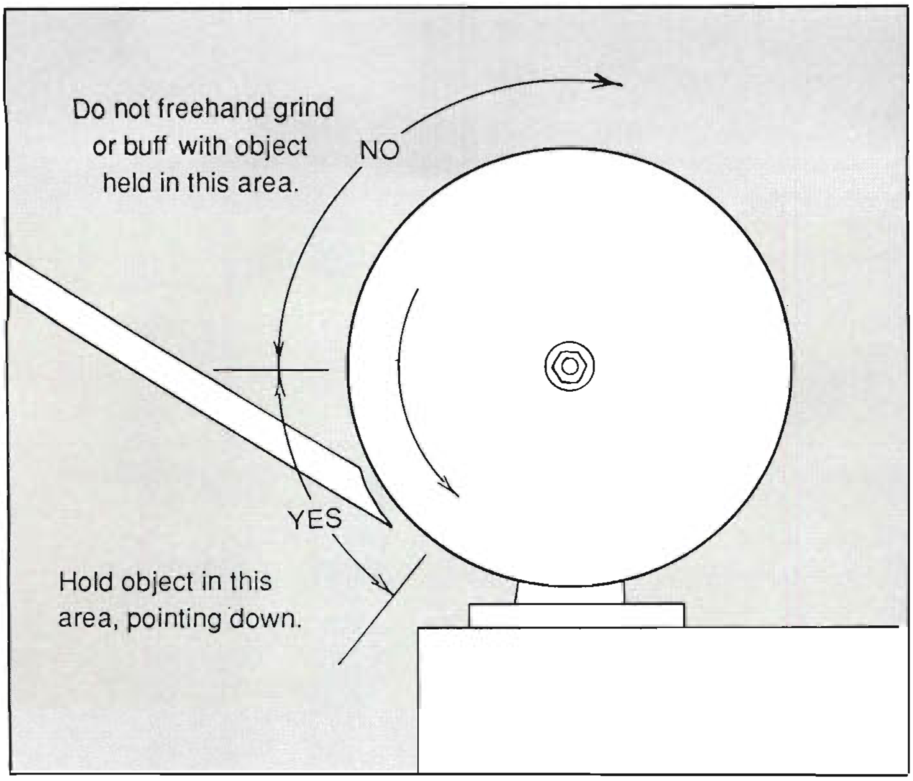
on ¾″ pine riser pads. These pads are also needed under the pillow blocks to give clearance for the drive shaft pulleys.

After you have checked that the tool and motor arrangement is satisfactory, drill and cut a slot near the center of the intermediate drive shaft for the V-belt that brings power up to it. To allow adjustments in the tension of this belt, mount the motor on a hinged board that will permit you to raise it and lower it slightly.

To maintain proper belt tension and smooth running tools, you must securely fasten all components to the bench. I used ¼″ bolts to hold the motor and all mechanical equipment in place. Take special care to line up everything before you drill the holes. The V-belts should be square to the tool head shafts and the pillow-blocked drive shaft. Both the tool heads and the pillow block housings have slotted mounting holes to allow belt tensioning adjustments, which you will have to make from time to time.

When you have everything in place and bolted down, turn the belts over by hand a few times to see that your set up runs true. Belt tension should be somewhat less than that of an automobile fan belt, but not sloppy.

I mounted the light switch on the front of the bench, but would not do so again because of the potential hazard of accidentally bumping the switch on while leaning over the bench top. Mounting the switch on the side would reduce the likelihood of this happening, and at the same time, encourage the operator to stand aside for a few


Do not freehand grind or buff with object held in this area.
NO
YES
Hold object in this area, pointing down.

seconds while powering up. This is a good safety practice on any power tool.

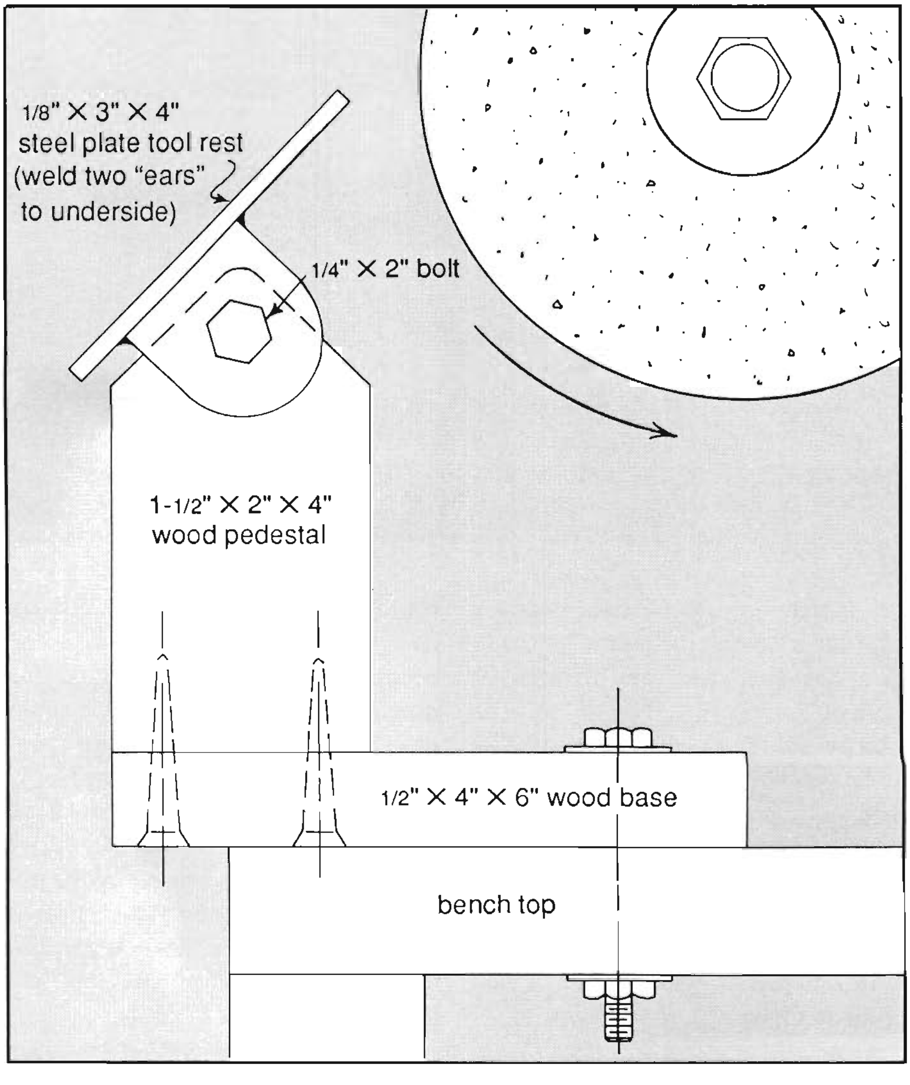
On the subject of safety, it's worth pointing out that unshielded, unhoused grinding wheels and the like pose a real threat to the careless or inexperienced operator. **Never**, and I do mean never, hold work in any position against the wheels that could throw the piece up or straight out towards you. This rule translates to a simple practice that will ensure safe use: always grasp the work firmly and hold it pointing down against the wheels in the lower front position, well below the level of the tool head shaft (see sketch). If you do accidentally lose control of your work, the piece will probably be thrown down against the bench or floor instead of out towards you. Don't be tempted to hold work on the top of the wheel—it's asking for trouble. These rules apply to freehand buffing, wire brushing, grinding, or any other front facing operations. Use of a face shield or goggles should be a standard routine with this piece of equipment.

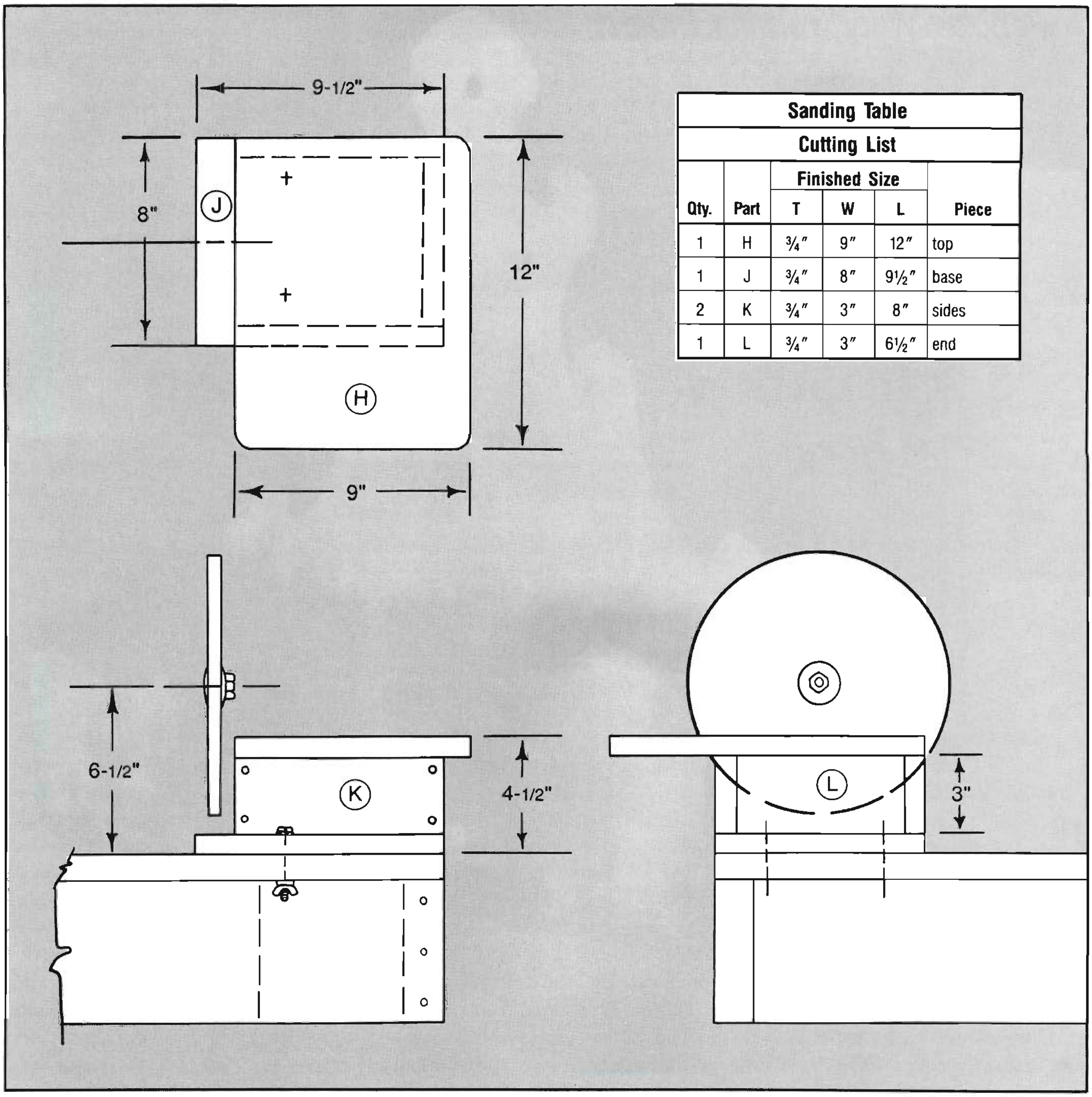
Do not attempt freehand tool grinding on the utility bench unless you are pointing the work down. For grinding chisels and plane blades, which are normally slanted up against the front of the wheel, you'll need a tool rest. A simple adjustable rest I made from a ⅛" steel plate and wood bolts to the bench top.

The manufacturer of one of my tool heads (General Hardware) cautions against using grinding wheels on the tool head. This warning probably has something to do with the absence of a tool rest and wheel guard that most grinders are equipped with.

[*Editor's note: Although the author has used this unit without a guard around the grinding wheel,* Popular Woodworking ***strongly*** *recommends that you devise or purchase some type of protective housing for it.*]

The best sanding disk for the utility bench would be one borrowed from a conventional stationary disk sander. Sears sells such a replacement disk for





Sanding Table
Cutting List

Qty.	Part	Finished Size T	W	L	Piece
1	H	¾″	9″	12″	top
1	J	¾″	8″	9½″	base
2	K	¾″	3″	8″	sides
1	L	¾″	3″	6½″	end

their belt/disk sander. If you can fit one of these on the end of your tool head shaft you will have a good set up. The only disadvantage of the heavy radial saw disk I use is that the center hole and hardware (shaft, flange, and nut) restrict usage to the outer portion of the disk. On a large disk this is not as much a handicap as it would be on a small disk (6″ or 7″ diameter).

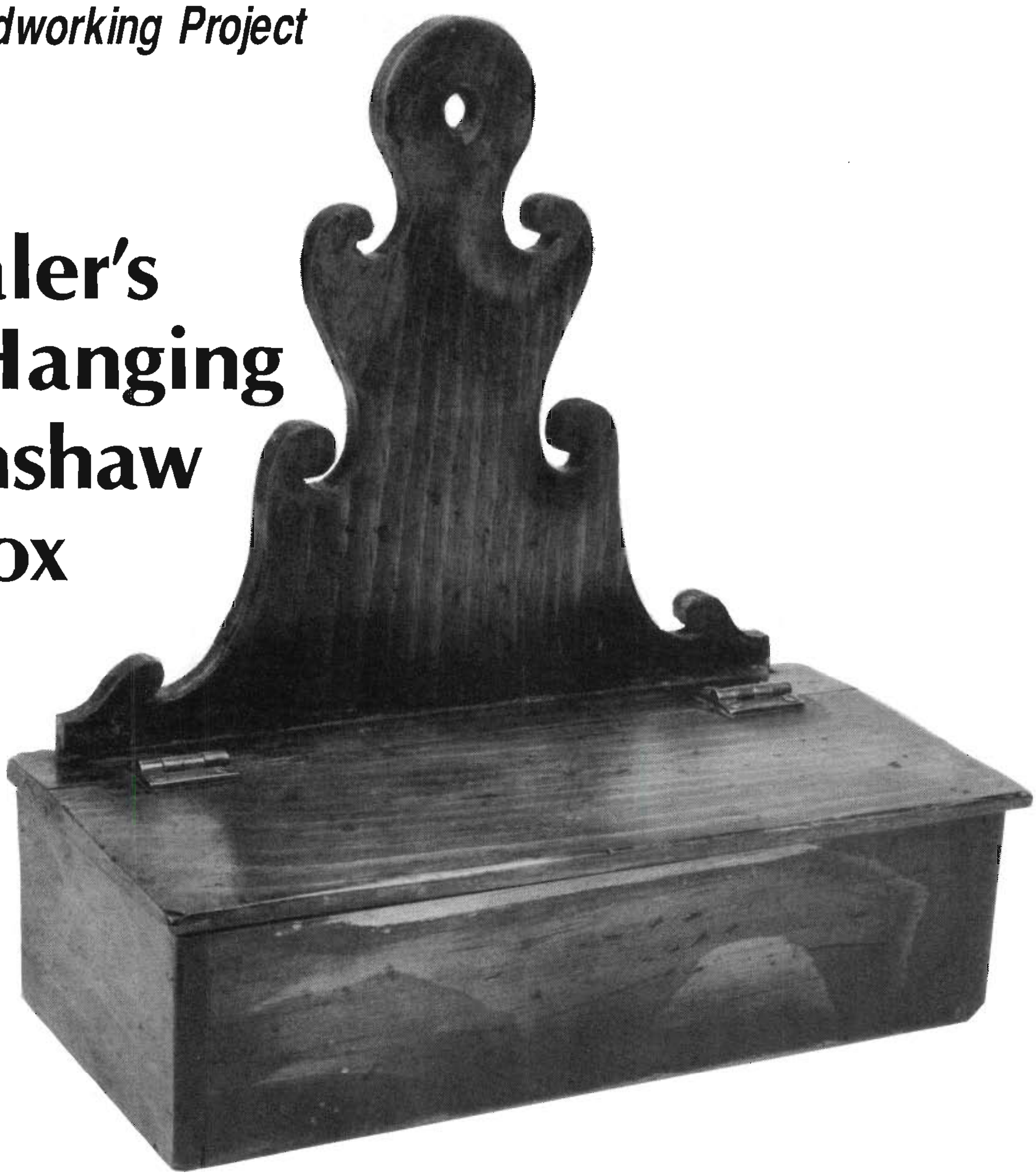
An adjustable tilt table with miter gauge would be a handy accessory for the disk sander. Lacking the resources to make this luxury, I built a simple box that bolts to the bench top and squared it to the disk. This setup is adequate for rounding corners or sanding irregular shapes. If you do a lot of mitering, you might want to cut a groove in the top for a miter gauge.

Maintenance of the power utility bench is minimal. Oil cups on the tool heads feed the babbit bushings and should be filled with heavy motor oil occasionally. Watch belt tension. Once in a blue moon you should grease the pillow blocks, which are normally fitted with automotive-type grease fittings. That's about it. I don't imagine the babbit sleeve bushings on the tool heads will last a person's lifetime, but replacement seems like it should be rather straightforward.

This utility bench is just the ticket for the home craftsperson who must operate on a limited budget. The convenience of having four different tools on one compact bench is one feature you'll appreciate. PW

A Popular Woodworking Project

Whaler's Wall—Hanging Scrimshaw Box



by John A. Nelson

The unique practice of engraving or scratching a design into the surface of a whale's tooth is called Scrimshaw. It was originally practiced by seafaring men on whaling expeditions. Nineteenth century whalers, especially those from Nantucket and New Bedford, Massachusetts, came back from long whaling voyages with engravings depicting seacoast towns or clipper ships and early side-wheelers. Today, this early practice is considered a form of art. Those original scratched teeth are rare and command extremely large selling prices.

This project is a mid-1800's seafarer's tool box. It has simulated ocean waves on the back panel, a lift lid with brass hinges, a compartmented interior to secure each individual tool, and of course, a large space to store a whale's tooth or two for future engraving. Landlubbers will find it useful for other things, and it makes a nice decoration for a country home.

An interesting point to note is that the back of the original scrimshaw box had deep arched grooves caused by "gimbaling" on a nail or hook on a whaling ship for many years. The original was constructed entirely of walnut and is believed to be of Rhode Island origin. To make your reproduction as authentic as possible, you might want to use square nails which can be ordered from Tremont Nail Company, 21 Elm Street, P.O. Box 111, Wareham, MA 02571.

John A. Nelson is a woodworker and drafting instructor from Peterburough, New Hampshire, and the author of more than 15 books on those subjects, including Antique Furniture Reproduction *(Van Nostrand Reinhold Company, Inc., 135 West Street, New York, NY 10020).*

Scrimshaw Box

Cutting List

		Finished Size			
Qty.	Part	T	W	L	Piece
1	A	5/16"	9"	10 1/2"	back
2	B	5/16"	2 1/2"	4 1/2"	sides
1	C	5/16"	2 1/2"	9"	front
1	D	5/16"	3 7/8"	9"	bottom
1	E	5/16"	7/8"	10"	top
1	F	5/16"	3 3/4"	10"	lid

Instructions

Begin by planing or re-sawing the wood down to the required 5/16″ thickness. Cut each individual part to its overall size and sand all surfaces of each part, but do not round any edges.

Draw out a ½″ square grid on a large sheet of paper and carefully transfer the backboard's shape, to this grid, point-for-point. Transfer this shape to the backboard and cut it out. Cut just to the outside of the lines and carefully file or sand back to the lines. Re-sand the front and back surfaces.

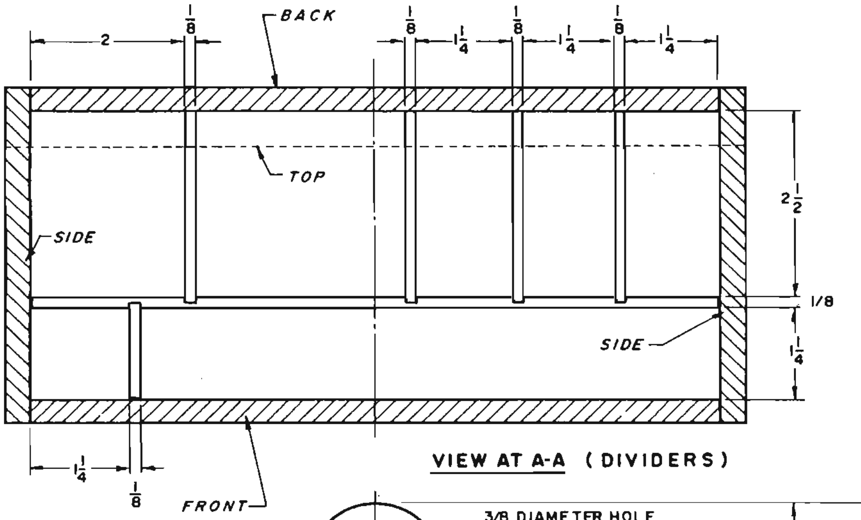
Notch the top board and lid to accept the two brass hinges. Plane the taper on the lid as shown. Dry-fit all pieces of the box together to check that everything fits correctly. With the exception of the top, glue and nail the box together. Take care not to get any glue on the surfaces of the box. Sand all over using a fine grit paper and keep all corners sharp.

Make the interior dividers if you choose; the layout here was taken from the original box. You may want compartments of different sizes, or none at all. If you do make dividers, fit them inside the box and glue the assembly in place.

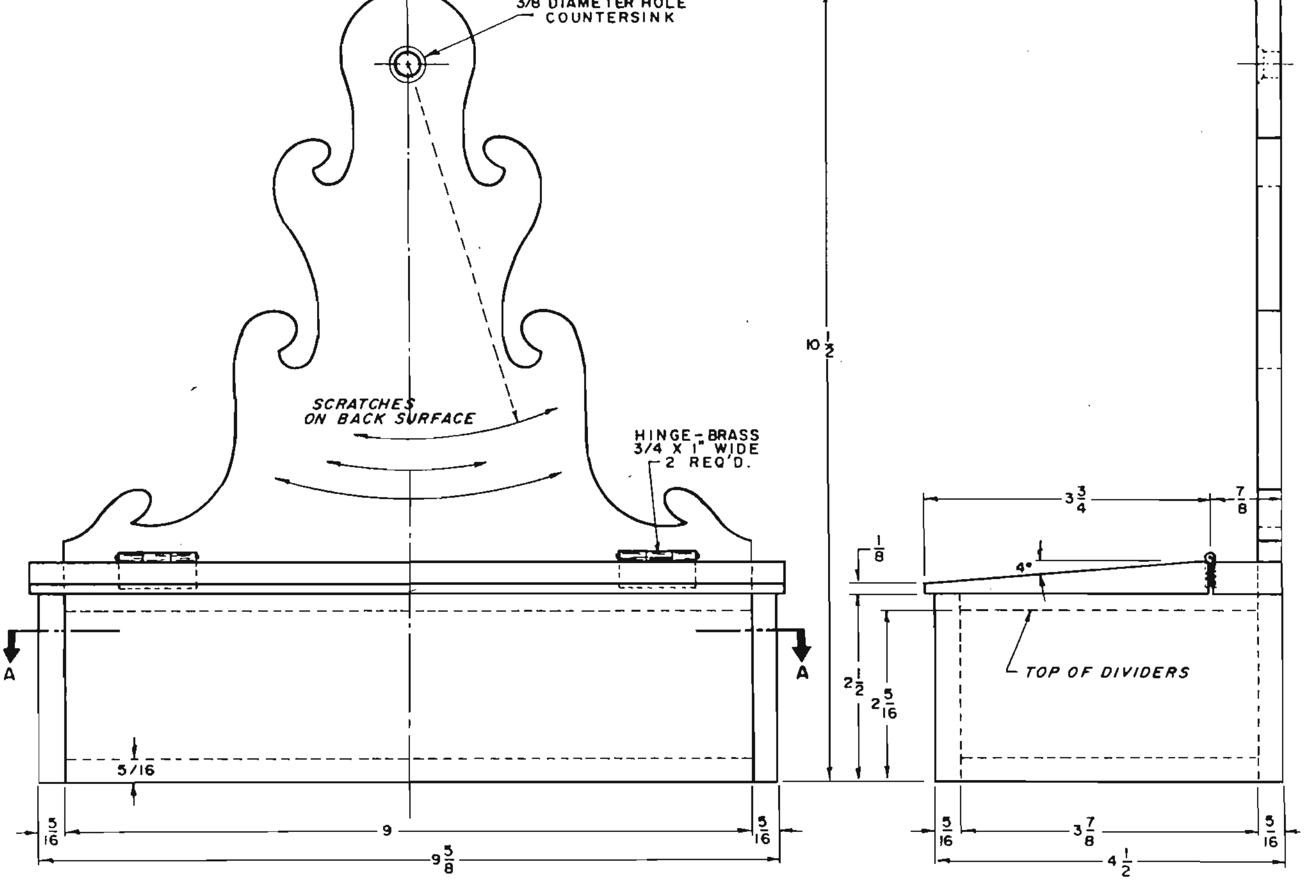
Before gluing and nailing the top in place, attach the two brass hinges and the lid together — it's easier to do at this stage. Check for correct movement of the lid. If everything works correctly, glue and nail the top in place with the lid and hinges attached.

Finishing

Finish your scrimshaw box using any good satin finishing process you like. If walnut was used, choose a clear finish to bring out the true color and beauty of the wood. Now may not be the time to take up whaling, but this handsome "antique" can have lots of other uses. **PW**



VIEW AT A-A (DIVIDERS)


3/8 DIAMETER HOLE COUNTERSINK
SCRATCHES ON BACK SURFACE
HINGE-BRASS 3/4 X 1" WIDE 2 REQ'D.
10 1/2
A
A
5/16
5/16
9
5/16
9 3/8
3 3/4
7/8
4°
1/8
2 1/2
2 5/16
TOP OF DIVIDERS
5/16
3 7/8
5/16
4 1/2

by Howard Robinson

Applying Mathematics to Woodworking

Anyone would agree that a successful woodworker must possess certain equipment and tools. He must also acquire a variety of skills and a strong desire to learn through practice and patience.

Part of these skills involves careful planning and layout. Good layout requires careful measurement and an ability to work with fractions. A woodworker should also have a knowledge of geometry which can be used and applied to projects.

Here are three common woodworking procedures which are based on geometric principles. For each example, I will explain the geometry involved, and show how I applied the principle to a woodworking project so you can see it in action.

Geometric Principle #1—Finding the centerline of a board. "If three lines intercept proportional segments of two transversals, then the three lines are parellel."

There will be many occasions where you wish to divide a board into two boards of equal width. This principle tells you how to find the center line.

Thus, if lines A, B, and C intercept equal segments M and N and equal segments R and S, then lines A, B and C are parallel. As the board edges are parallel, it follows that C is parallel to the edges. This procedure can also be used to divide a board into several boards of equal widths.

Geometric Principle #2—Finding the center of a circle or an arc. "The perpendicular bisectors of any two chords of a circle meet at its center."

To find the center of a given circle, or an arc, is easy. Simply trace the curvature of the known circle or arc on paper and apply the details shown.

If you have a broken section of a large circle (18"–36") and you wish to duplicate the full circle, you must determine its radius. In my own case, a friend of mine insisted on an exact duplication of a large circular board on which a family heirloom had been mounted. However, the board had somehow been broken and only a small portion of the rim remained.

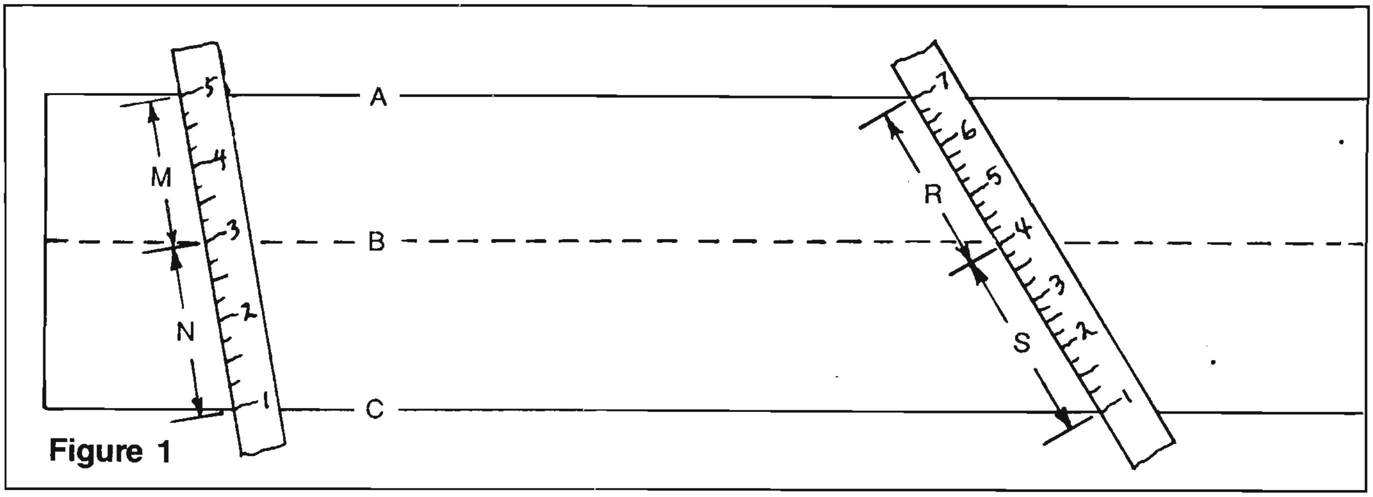


Figure 1

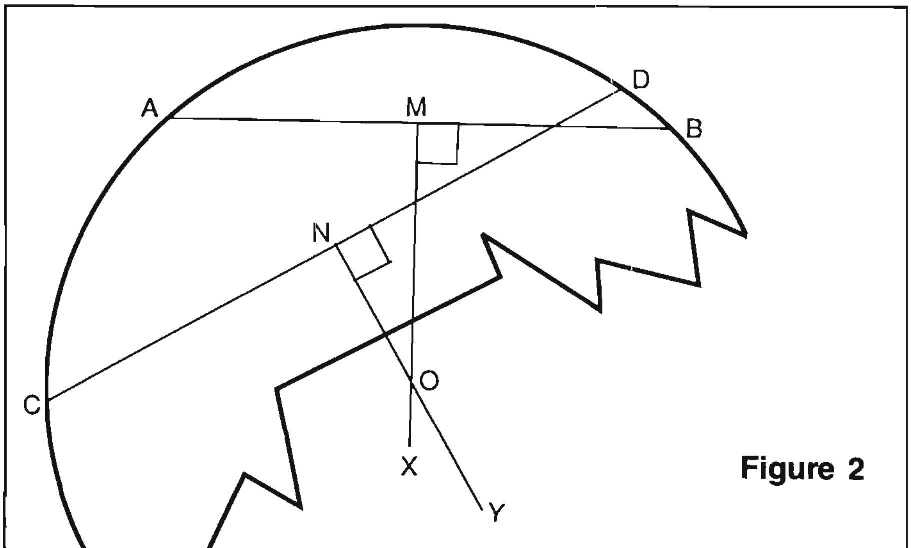


Figure 2

Draw two random chords (AB and CD).
Draw the two bisectors of the chords (MX and NY).
The intersection point of MX and NY is the center of the circle (O).

No problem. I found a large piece of cardboard about 36" square, traced the curvature of the arc and then I followed the steps as outlined. This produced the radius I needed to complete the broken arc.

Geometric Principle #3—Finding the radius of an arc. "If two chords intersect within a circle, the product of the segments of one chord equals the product of the segments of the other chord."

Although the chords can meet anywhere, we purposely make CD perpendicular to AB at its center, for this then allows us to apply Principle #2–finding the center of a circle or arc.

My home was built about 1930 and has a front door entrance with an arch window. I needed a storm window for it, and

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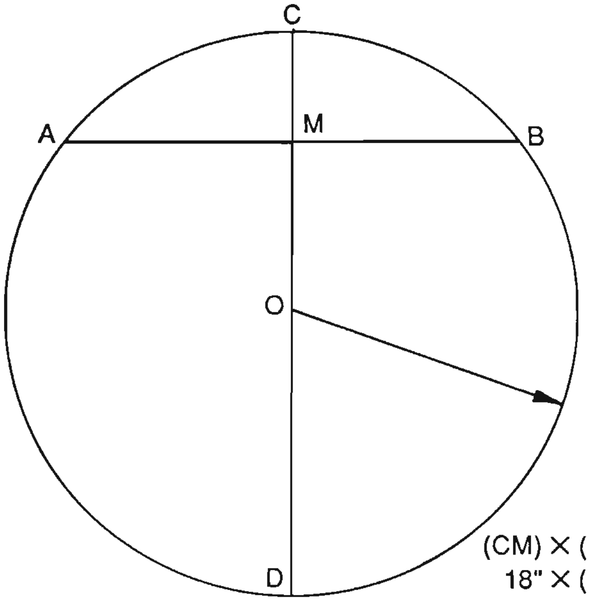
Howard Robinson is a retired math teacher and a woodworking hobbyist in Lakewood, Ohio.

since it wasn't a standard size, the cost for an aluminum one was outrageous. So I decided to construct the storm window myself out of redwood. The arch window required the use of Principle #3 to make a template for its construction (see Figure 3).

To make the template the shape of the arch requires you to find the radius, its span, and the height of its crown. The last two dimensions are measured directly. To determine the radius, I employed Principle #2.

I sincerely hope you will inform other fellow woodworkers of some extra applications for high school mathematics. **PW**

Figure 3



(CM) × (MD) = (AM) × (MB)
18" × (MD) = 36" × 36"
18" × (MD) = 1296
MD = 72"
and CD = 90"
thus OB and OC = 45"
and OM = 27"

Ht. of crown (CM) = 18"
Span of arch (AB) = 72"
Radius (OB) = ?
Diameter (CD) = ?

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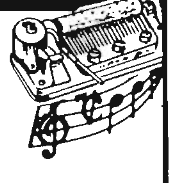

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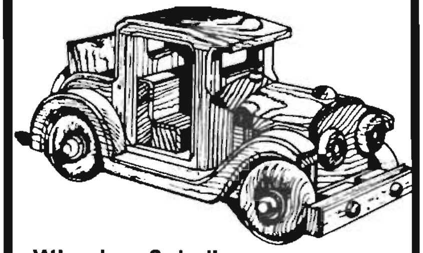

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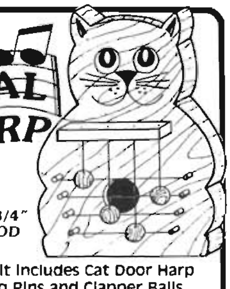

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3002-1	Electricians rt angle kit	290	170
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1676-1	H.D. Hole Hawg w/cs	375	230
6511	2 sp sazsall w/cs	207	118
6405	8¼ circle saw	199	122
6750-1	Drywall driver 0-4000	141	85
6798-1	Tek screwdriver	173	105
6226	2 sp bandsaw w/case	416	250
6234	TSC bandsaw w/case	416	250
6507	TSC sazsall w/case	219	129
6170	14" chop saw	349	209
6012	Orbital sander 3⅝" x 7⅞"	179	100
6014	Orbital sander 4½" x 9¼"	189	108
6305	6¼" cordless circle saw	239	134
6753-1	Drywall driver 3.5A	125	73
8977	Var. temp heat gun	108	70
0214-1	⅜" v. spd. cordless drill	209	125
5397-1	⅜" v. spd. hammer drill kit	227	145
0211-1	⅜" cordless driver drill	205	120
0212-1	⅜" v. spd. cordless drill	229	125
5371-1	½" v. spd. Hammer Drill Kit	313	199
3107-1	½" v. spd. Rt. Angle Drill Kit	305	189
1854-1	Super hole shooter-10A	530	350
6232	4¾" bandsaw w/case	452	275
6747-1	Drywall driver-0-2500	141	85
0230-1	⅜"drill 0-1700 rpm	165	100
3300-1	½" v spd. Magnum Rt. Angle Kit	279	180
5620	Router 1 H.P. — 8 amp	289	175
5660	Router 1½ H.P. — 10 amp	299	180
5680	Router 2 H.P. — 12 amp	350	220
5455	7/9" polisher 1750 rpm	199	130
5535	7"polisher 2800 rpm	209	140
6215	16" chain saw	229	140
8975	Heat gun	81	55

6366	7¼" circular saw	187	105
6368	7¼" circular saw	216	125

Model 6366 includes C.T. blade, rip fence quide & blade wrench. Model 6368 includes all of the above plus case

BRAND NEW
MODEL RA200 BY RYOBI
BENCH TOP RADIAL 8¼"
SPECIAL SALE 225.00

X-TRA SPECIAL FREUD MODEL LU73M010
60 TOOTH ATB BLADE 10"
LIST 79 — SALE 27
5 FOR 119

FREUD SAW BLADES

⅝" Bore — Industrial Grade
CARBIDE TIPPED SAWBLADES

Item No.	Description	Diam.	Teeth	List	Sale
LU72M010	Gen'l Purp.	10"	40	68.58	34
LU82M010	Cut-Off	10"	60	86.40	44
LU84M011	Combination	10"	50	74.51	37
LU85M010	*Super Cut-Off*	*10"*	80	110.88	62
LM72M010	Ripping	10"	24	64.85	34
DS 306	6" Dado			139.00	92
DS 308	8" Dado			170.00	105
PS203	Gen'l Purp.	7¼"	24	27	17.50
PS303	Plywood	7¼"	40	33	20.50

MAKITA CORDLESS

Model		List	Sale
6002DWK	⅜"Drill Kit 2 Spd. Rev. 7.2 v	178	91
6070DW	⅜" Var. Spd. Rev. 7.2v	108	57
6071DWK	⅜"Var. Spd. Rev. w/removable batt.	180	102
4300WD	Jig Saw	188	99
5081DW	3⅜" Saw Kit	212	95
5600DW	6¼" Circular Saw	284	125
9035DW	Finishing Sander	168	73
6010DWK	⅜" Cordless Drill Kit	174	88
6010SDW	⅜" Cordless Drill	94	45
8400DW	⅜" Hammer Drill	224	105
DA3000DW	⅜" Angle Drill	218	98
6010DL	⅜" Drill w/Flashlight	188	89
6012HDW	⅜" 2 spd Driver Drill w/Bat & Metal Case	208	94
DK1002	⅜"Drill w/Flursnt Lt	176	90
6710DW	Cordless Screwdvr Kit	176	84

Model	MAKITA BATTERIES	List	Sale
7.2 Volt		40	27
9.6 Volt		44	29
10.8 Volt		99	66

MAKITA TOOLS

Model		List	Sale
5007NBA	7¼" Saw w/Elec. Brake	186	114
5008NBA	8¼" Saw w/Elec. Brake	212	130
B04510	Sander	92	43
9900B	3" x 21" belt sander	234	119
9924B	3" x 24" belt sander	222	130
9924DB	3" x 24" b/sand. w/bag	248	130
9035	⅓ sheet finish sander	96	48
9045B	½ sheet finish sander	186	90
9045N	¼ sht fin. sand. w/bag	190	105
4200N	4⅜ circ. saw 7.5 amp	182	93
5201NA	10¼ circ. saw 12 amp	438	215
4300BV	v/sp jig saw 3.5 amp	234	117
4301BV	orb v/sp jig saw 3.5 amp	248	125
JR3000WL	2 sp recip saw w/cse	198	120
JR3000V	vs recip saw w/case	208	110
LS1000	New 10" Mitre Box	396	198
9820-2	Blade Sharpener	288	159
410	Dust Collection Unit	410	269
3705	Offset Trimmer	218	115
1900BW	3¼" planer w/case	198	93
1100HD	3¼" planer w/case	328	160
9207SPC	7" Sander-Polisher	250	140
3601B	1⅜ hp router	218	115
3700B	½ hp trimmer	162	82
9501B	4" Grinder Kit	119	55
B04530	6" Round Sander	98	48
DA3000R	⅜" angle drill	212	129
DP4700	½ v/sp w/rev 4.8 amp	178	92
HP1030W	⅜ v.s.r. hammer drill w/cs	168	98
6300LR	½" angle drill w/rev	288	152
8419BB-2W	½" s sp. hammer w/cs	268	150
2708W	8¼" Table Saw	348	196
GV5000	Disc Sander	108	53
6800DB	2500 rpm 3.5 amp	146	79
6800DBV	0-2500 rpm 3.5 amp	156	89
6801DB	4000 rpm 3.5 amp	146	79
6801DBV	0-4000 rpm 3.5	156	89
2030n	12" planer/jointer	2580	1475
2040	15⅝" planer	2180	1195
1805B	6⅛" planer kit w/case	498	265
JV1600	var. speed jig saw	178	89
JV2000	var. speed orb. jig saw	198	100
5005BA	5½" circular saw	192	98
5007NB	7¼" Circ. Saw	158	94
9503BH	4½" sander-grinder kit	166	95
4014NV	var/speed blower	168	79
DP3720	⅜ drill Rev. 0-1800 rpm	99	47
6510LVR	⅜ drill Rev. 0-1500 rpm	144	65
6013BR	½" Drill rev. 6 amp	208	100
5402A	16" Circular Saw - 12 amp	542	315
3612BR	3 HP Plunge Router	338	172
9401	4x24 belt Sander w/bag	288	160

SKIL SIZZLERS

Model		List	Sale
5510	(551) 5½" Circ. Saw	130	83
5625	(552) 6½" Circ. Saw	164	108
5650	(553) 7¼"Circ. Saw	164	108
5665	(554) 8¼" Circ. Saw	185	118
5750	(807) 7¼" Circ. Drop Foot	175	115
5765	(808) 8¼" Circ. Drop Foot	204	130
5790	(810) 10¼" Circ. Drop Foot	350	225
5825	(367) 6½" Worm Saw	252	135
5865	(825) 8¼" Worm Saw	277	149
3810	10" Mitre Saw	349	169
7565	Palm Sander	69	37

SKIL BRAND NEW MODEL 2735-04
⅜" **12 Volt** Professional Cordless 2-Speed Drill, X-Tra Special Complete With Charger, 2 Battery Packs and Case
LIST 210 SALE 119

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WORLD FAMOUS #77
7¼" WORM SAW
LIST 254 SALE 129

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34-410 Saw Complete w/1½ H.P. motor & stand
679.00

33-150 Saw Buck
Special Sale 499.00

22-651-RC-33 13" Planer
979.00

22-243 S 14" Band Saw w/open stand. ½ H.P. motor
499.00

28-283F 14" Band Saw w/enclosed stand & ¾ H.P. motor
599.00

43-122 Lt. Duty Shaper w/stand & 1 H.P. motor
499.00

HITACHI 15" MITRE SAW #C15FB
LIST 630 - SALE 389
15" C.T. BLADE - SALE 125

DELTA
#34-080
10" MITRE
BOX
XTRA SPECIAL
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LIST 279.00

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CARBIDE TOOTH SAW BLADE

- Advanced saw blade technology. Exclusive design out-performs regular carbide blades
- An excellent all-purpose blade

Model#	Diameter	#Teeth	List	Sale
73-756	6-1/2	36	26.90	14.80
73-717	7-1/4	18	11.72	6.45
73-737	7-1/4	24	14.92	8.20
73-757	7-1/4	40	27.40	15.10
73-758	8	40	39.90	21.95
73-759	8-1/4	40	40.66	22.35
73-739	9	30	29.52	16.25
73-769	9	60	64.40	35.40
73-740	10	32	30.98	17.00
73-770	10	60	64.90	35.75

REMINGTON FASTENER SYSTEM

Model		List	Sale
476	Power Hammer (for do-it-yourselfer)	35	26
480	Power Driver — lowest priced trigger actuated comp w/case	159	110
482	Multi Driver — top of the line complete w/case	329	235

Model		Per 100/Box
15549	Penetration Control Discs ⅞" dia	3.00
	POWER LOADS	
29278	Gray - Light Duty	4.25
29280	Brown - Medium Duty	4.25
29282	Green - Heavy Duty	4.25
29284	Yellow - Extra Heavy Duty	4.25
	STANDARD PIN	
58047	SP75 (¾")	3.85
58048	SP100 (1")	4.40
58049	SP125 (1-¼")	5.35
58050	SP150 (1-½")	5.85
58051	SP200 (2")	7.35
58052	SP250 (2-½")	8.35

SENCO AIR POWERED NAILERS

SFN1	Finishing to 1¾"	349	269
SFN2	Finishing to 2½"	529	398
SN2	Sheathing - Siding, etc.	525	395
M2	All Purpose	440	330
SN4	Const. Framing, etc.	635	485
LS2	Moulding & Trim	325	259
LS4	Moulding & Trim	330	265

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PROFESSIONAL POWER TOOLS FROM PANASONIC

Model EY570B features keyless chuck ⅜" 9.6 volt 2 speed — 350 low - 1000 high highest torque - 143 in lbs. 5 position clutch 1 hour charger complete w/case - battery - charger
List Price 209.00 Special Sale 139.00

Model EY561B features Jacobs keyed chuck ⅜" 7.2 volt 2 speed — 300 low - 880 high torque in low - 104 in lbs. 5 position clutch. 1 hour charger complete w/case - battery - charger
List Price 179.00 Special Sale 119.00

Model EY551B features Jacobs keyed chuck ⅜" 7.2 volt one speed - 460 rpm torque - 48 in lbs. weight 2 lbs 1 hour charge No case available includes charger
List Price 119.00 Special Sale 79.00

EY970B-9.6 batteries **List 59.70 Sale 44.00**
EY961B-7.2 batteries **List 46.30 Sale 33.00**
EY991B-Keyless chuck **List 35.00 Sale 26.00**
EY561B 7949 Holster (fits EY570B & EY561B)
List 10.20 Sale 8.00

★NEW LOW PRICES★
PONY CLAMP FIXTURES
— JORGENSON —

Model		List	Sale	Lots of 12
#50	for ¾" Black Pipe	11.23	7.15	79.00
#52	for ½" Black Pipe	9.36	6.10	67.50

••MAKITA NEW TOOLS••

Model		List	Sale
6092DW	Cordless Driver Drill Kit 2 Spd.-var. spd. rev. w/o clutch complete w/case	208	106
6093DW	Cordless Driver Drill Kit 2 Spd.-var. spd. rev. and 6 stage torque setting complete w/case	224	119
6891DW	Cordless Drywall Screwdriver Kit 0-1400 R.P.M.-Lt. weight - 2.9# complete w/case	204	109
3620	1¼ H.P. Plunge Router 7.8 amp-24,000 R.P.M. complete w/case	166	89
4302C	Electronic Jig Saw orbital, var. spd. 6 amp.	256	139
5077B	7¼" Hypoid Saw (similar to worm drive) 13 amp-4,300 R.P.M.	250	133

Who Has The Saws That Cut It Across The Board?
BLACK & DECKER of course!!!

Model	WORM DRIVE SAWS	List	Sale
3050	6½" 12 amp - 4600 rpm	247	169
3051	7¼" 13 amp - 4300 rpm	232	135
3052	8¼" 13 amp - 4300 rpm	247	169

BUILDERS SAW CAT

3030	7¼" 13 amp - 5800 rpm	155	100
3035	8¼" 13 amp - 5800 rpm	175	125
3034	7¼" 13 amp - 5800 rpm	162	110
3033	6½" 13 amp - 5800 rpm	162	115

BLACK & DECKER CORDLESS

1920	⅜" Rev. H.S. Drill Kit	174	99
1921	⅜" Rev. H.S. Drill	135	84
1930	⅜"Rev. H.S. Drill Kit w/cs	181	103
1940	⅜" Rev. High-torque Drill Kit	174	99
1941	⅜" Rev. High-torque Drill	135	85
1950	⅜" Rev. High-torque Drill Kit w/cs	181	106
1970	⅜" Rev. High-torque Scrudrill w/cs	188	117
1975	⅜" Rev. High-torque Scrudrill	162	105
1980	⅜" Rev. Adj. Clutch Scrudrill Kit	184	100
1985	⅜" Rev. Adj. Clutch Scrudrill	158	98
2901	⅜" Rev. H.S. Clutch Scrudrill	192	118
2931	⅜" Rev. High-torque Clutch Screwdriver	192	118
5930	⅜" Hammer Drill Kit	199	124
5921	⅜" Hammer Drill	169	110

NOTE: IF YOU PURCHASE A #1940 - #1950 OR #1980 B & D CORDLESS RECEIVE A
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BOSCH TOOLS

		List	Sale
1581VS	Top Handle Jig Saw	225	129
1582VS	Barrel Grip Jig Saw	126	119
1942	Heat Gun 650°-900°	99	69
1272	3x24" Belt Sander	259	159
1272D	3x24" Belt Sander w/bag	274	169
1273	4x24" Belt Sander	274	169
12730	4x24" Belt Sander w/bag	289	179
11212	Bulldog ¾" SDS Rotary Hammer	329	175
1920VSKR	Var/Sp Cordless 2 Spd.	169	79
1196VSRK	⅜" hammer drill v.s.	190	109
1198VSR	½" hammer drill - 2 sp v.s.	199	119

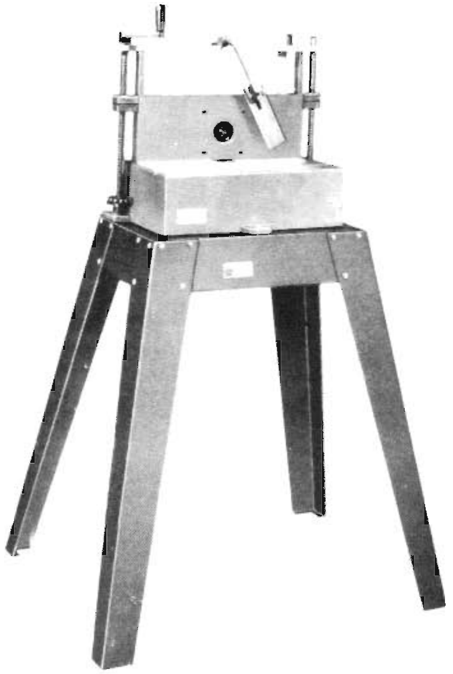
PORTER CABLE TOOLS

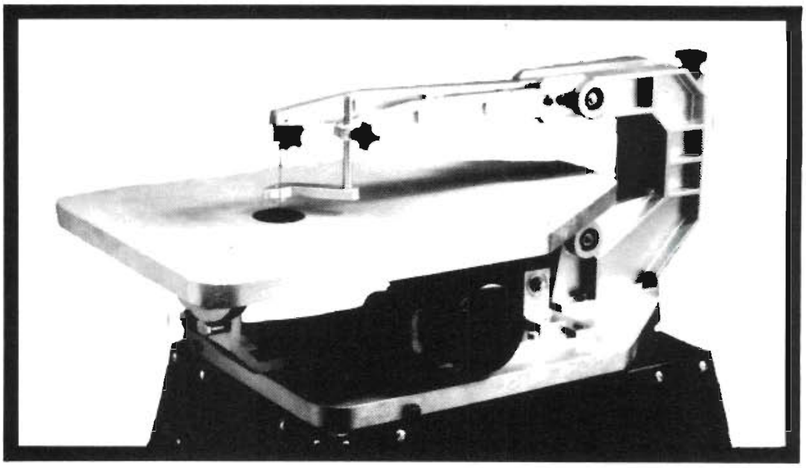
Model		List	Sale
630	1 H.P. Router — 6.8 AMP	150	93
690	1½ H.P. Router — 8 AMP	194	114
691	1½ H.P. Router D-Hdle.	218	129
536	1½ H.P. Speedmatic Router	300	184
518	3 H.P. Router 5 Speed	490	323
520	3 H.P. Router 15 AMP	460	298
309	Trimmer 3.8 AMP	130	84
310	Trimmer 3 AMP	190	124
312	Trimmer Offset Base	205	133
319	Trimmer — Tilt Base	215	138
695	H.D. 1½ H.P. Router/Shaper	278	190
696	H.D. Shaper Table	149	104
351	3 x 21 Belt Sander w/o Bag	189	125
352	3 x 21 Belt Sander w/Bag	199	115
360	3 x 24 Belt Sander w/Bag	280	185
361	3 x 24 Belt Sander w/o Bag	260	175
362	4 x 24 Belt Sander w/Bag	295	198
363	4 x 24 Belt Sander w/o Bag	280	185
587	7¼ Speedtronic 14.5 AMP Saw	199	125
315-1	7¼ Top Hdle. 13 AMP	166	96
617	7¼ Push Hdle. 13 AMP	166	96
346-1	6½" Top Hdle. 12 AMP	161	100
368-1	8¼" Top Hdle. 13 AMP	176	110
314	4½" Trimsaw 4.5 AMP	180	109
548	X-H Duty Bayonet Saw	235	155
9548	X-H Duty Saw w/case	255	169
9629	Recip Saw v/sp 8 AMP	204	133
9627	Recip Saw 2 Speed 8 AMP	193	124
666	⅜" H.D. v/sp Drill	165	115
620	⅜" H.D. 4 AMP 1000 R.P.M.	124	85
621	⅜" H.D. v/sp 0-1000 R.P.M.	130	78
320	Abrasive Plane	129	89
126	Porta-Plane — 7 AMP	265	179
9118	Porta-Plane Kit	299	186
653	Versa-Plane — 10 AMP	399	265
9652	Versa-Plane Kit	419	275
7545	V.S. Drywall Gun H.D.	163	110
505	½ sht pad sander	180	100
7511	⅜" v. sp. drill 5.2 amp	164	102
7514	½" v. sp. 0-750 H.D. drill	169	104
666	⅜" H.D. v/sp. T hdle 4A	165	110
303	Paint remover	220	145
304	7" disc sander 4000 rpm	175	110
305	7" disc polisher 2000 rpm	175	110
367	3¼" plane 6.5 amp	187	120
537	1½ HP router d. hdle	315	189

X TRA SPECIAL BY PORTER CABLE

		List	Sale
9118	Porta Plane Kit	299	185
7548	Top Handle Jig Saw	199	119
7648	Barrel Grip Jig Saw	199	119
330	Bloc Sander ¼ Sheet	90	52

BUY ANY 7¼" CIRCULAR SAW IN THIS AD AND RECEIVE ONE 7¼" — 24 TOOTH SANDVIK GENUINE TUNGSTEN CARBIDE CONTRACTORS SAW BLADE — A $6.95 VALUE COMPLETELY FREE OF CHARGE.





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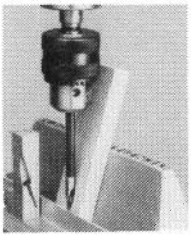

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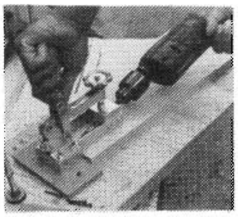

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ALL NEW DESIGNS — INTERCHANGEABLE BASES — NEW MORE POWERFUL MOTORS

Model	Description	List	Sale
1608	5.6 AMP — 3.5# UL Listed	129	75
1608L	Same As Above W/Trim Guide	135	79
1608T	5.6 AMP — Tilt Base UL Listed	149	89
1609	5.6 AMP — Offset Base UL Listed	189	115
1609K	Laminate Installer's Kit Supplied With 1609 Offset Base Laminate Trimmer, Tilt Base, Router Base, Laminate Trimming Guide, ¼" Collet, Collet Nut, 2 Wrenches, 2 MM Hex Key, 4 MM Hex Key, Steel Case LIST 269.00 SALE 159.00		

BOSCH SHOP ROUTERS

Model	Description	List	Sale
1601	1 H.P. — 790 Watt Motor — 25,500 R.P.M.	149	84
1602	1½ H.P. — 1000 Watt Motor — 25,000 R.P.M.	185	105
1603	1½ H.P. D-Hdle Style 1000 Watt	209	115
1604	1¾ H.P. 10 AMP 25,000 R.P.M.	209	115
1606	1¾ H.P. D-Hdle Style 1120 Watt	233	128
93940	Overarm Router W/O Motor	1000	795
93950	Overarm Router W/#90300M 3¼ H.P. Router Motor	1140	895

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Calendar

Events of Interest to Woodworkers

August 1-August 6. Portland, OR
A Contemporary Wood Exhibit curated by Sam Maloof. For more information contact Linda Antolic, Contemporary Crafts Gallery, 3934 SW Corbett, Portland, OR 97201, or call (503) 223-2659.

August-September 30. Pittsfield, MA
Shaker Workmanship 1987 showcasing baskets, iron and tin ware, popular and leather work, textiles, woodwork, and miniture items. At the Hancock Shaker Village. For more information contact Joan D. Clemons, Hancock Shaker Village, P.O. Box 898, Pittsfield, MA 01202, or call (413) 443-0188.

August 3-September 23
Shopsmith Academics announces courses in jigs, cabinetmaking, veneers, turning, and fundamentals. Call for specific dates and locations nearest you 1-800-762-7555.

August 6-August 30. Seattle, WA
A show of furniture by Tom Deady. For more information contact Cheryl Peterson, Northwest Gallery of Fine Woodworking, 202 First Ave. South, Seattle, WA 98104 or call (206) 625-0542.

August 9-12. Chicago, Il
1987 National Hardware Show at the McCormick Place Complex. For more information contact Pat Dolson, Cahners Exposition Group, Cahners Plaza, 999 Summer St., Stamford, CT 06905 or call (203) 964-0000.

August 9-14 & 24-28. Marshall, NC
Windsor chairmaking and white oak basketry workshops at the Country Workshops. For more information contact Country Workshops, 90 Mill Creek Rd., Marshall, NC 28753 or call (704) 656-2280.

August 9-15. Frontenac, MN
4th annual Villa Maria Woodcarving Workshop. Classes offered include relief carving, animal carving, and western caricatures. For more information write to P.O. Box 37051, Minneapolis, MN 55437.

August 13-16. Claremont, CA
Southern California Woodworking Conference on the campus of Harvey Mudd College with demonstrations and workshops by Sam Maloof, Rude Osolnik, Art Carpenter, and others. For more information contact Howard Lewin, Southern California Woodworking Conference, 264 Arbolada Dr., Arcadia, CA 91006 or call (213) 679-2485.

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Mini Cup . . . . **$7.00** per 100
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WT-1¼" . **$7.00 per 100**
WT-1½" **$10.00 per 100**
WT-1¾" **$15.00 per 100**
WT-2" . **$18.00 per 100**
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August 17-21. Raleigh, NC
1987 Sales Training Seminar at North Carolina State University's School of Forest Resourses. For more information contact R. Franklin Brown, Jr., Suite A-109, 251 West Dekalb Pike, King of Prissia, PA 19406 or call (215) 265-6658.

August 21-23. Berlin Fairgrounds, CT
Summer Craft Festival. For more information contact Arts & Crafts Festivals, Inc., P.O. Box 412, Canton, CT 06019 or call (203) 693-6335.

September 3-27. Seattle, WA
A collection of furniture and wood artistry at the Northwest Gallery of Fine Woodworking. For more information contact Cheryl Peterson, Northwest Gallery of Fine Woodworking, 202 First Ave. S., Seattle, WA 98104 or call (206) 625-0542.

September 4-6. Nashville, TN
Tennessee Woodworking Show at the Nashville Convention Center, West Hall, 601 Commerce St., Nashville, TN. For more information call (213) 477-8521 in California or 1-800-826-8257.

September 5-7. Lancaster, PA
9th Annual Long's Park Art and Craft Festival. For more information contact Long's Park Arts & Crafts Festival, P.O. Box 5153, Lancaster, PA 17601.

September 11-13. Cincinnati, OH
Greater Cincinnati Woodworking Show at the Cincinnati Convention Center, North Hall, 525 Elm St., Cincinnati, OH. For more information call (213) 477-8521 in California or 1-800-826-8257.

September 11-14. North Bend, OR
The International Wood Collectors Society annual meeting at North Bend, Oregon. For more information contact A.V. "Swede" Pearson, 6957 North Montana, Portland, OR 97217 or call (503) 289-1974.

September 12-13. Wrightstown, PA
"Pennsylvania Crafts Festival" at the Grange Fairgrounds. For more information contact United Craft Enterprises, Box 326, Masonville, NY 13804 or call (607) 265-3792.

September 12-13. Livermore, CA
California Carvers Guild annual woodcarving show at The Barn, 3000 Pacific Ave., Livemore. For more information contact Liz Finigan, 587 South N St., Livermore, CA or call (415) 447-3186.

September 16-19. Montreal, Quebec
Semi-annual meeting of the Wood Products Manufacturers Association at the Four Seasons Hotel in Montreal, Quebec. For more information contact Mr. Albert Bibeau, Wood Products Manufacturing Assoc., 52 Racette Ave, Gardner, MA 01440 or call (617) 632-3923.

September 18-20. Detroit, MI
Woodworking Show at Michigan Fairgrounds, Detroit. For more information contact The Woodworking Show, 1516 So. Pontius Ave., Los Angeles, CA 90025 or call (213) 477-8521.

September 18-20. Manassas, VA
7th Annual Virginia Crafts Festival at the Prince William County Fairgrounds. For more information send three first class stamps for postage to: Dean Verdier, Sugarloaf Mountain Works, Inc., 20251 Century Blvd., Germantown, MD 20874 or call (301) 540-0900.

September 18-October 18. Athens, OH
American contemporary works in wood display at the Dairy Barn Southeastern Ohio Cultural Arts Center. For more information contact the American Contemporary Works in Wood, P.O. Box 747, Athens, OH 45701 or call (614) 592-4981.

September 19-20. Harwinton, CT
Farmington Valley Craft Expo at the Harwinton Fair Grounds. For more information contact Arts & Crafts Festivals, Inc., P.O. Box 412, Canton, CT 06019 or call (203) 693-6335.

September 21-25. Memphis, TN
Hardwood Flooring Installation School. Complete information and applications are available from members or by writing the National Oak Flooring Manufacturers Association, 804 Sterick Building, 8 N. Third St., Memphis, TN 38103 or call (901) 526-0516.

September 23-November 12. Brookfield, CT
Brookfield Craft Center Inc. announces their 1987 fall workshops in technique, children's furniture, hand joinery, veneer inlaying, and small shop production with artisans Frank Klauzs, Tom Duffy and others. For more information contact Brookfield Craft Center Inc., P.O. Box 122, 286 Whisconier Rd., Brookfield, CT 06804 or call John Russel (203) 775-4526 or Debra Porter (203) 853-6155.

September 24-26. Burbank, CA
Wood Carvers Expo at the Los Angeles Equestrian Center in Burbank. For more information contact CCG Headquarters in San Simeon (805) 927-4718 or call Ross Stage (818) 843-4348.

September 25-27. Del Mar, CA
San Diego Woodworking Show at the Del Mar Fairgrounds, Crosby Hall, 2260 Jimmy Durante Blvd., Del Mar. For more information contact (213) 477-8521.

October 1-3. Philadelphia, PA
1st Annual Symposium. Lexington Conference Center, Lexington trade show, demonstrations. Registration is $125 members $175 for nonmembers; spouse agenda $65 extra. For more information contact the American Association of Woodturners, P.O. Box 982, San Marcos, TX 78667 or call Bob Rubel (512) 396-8689.

October 1-November 8. Seattle, WA
Northwest Invitational Showing of "Form! Function-Furniture." For more information contact Cheryl Peterson, Northwest Gallery of Fine Woodworking, 202 First Ave. S., Seattle, WA 98104 or call (206) 625-0542.

October 9-11. Rockford, IL
Woodworking World at the Metro Center. For more information contact Christine E. Murphy, Woodworking World Shows, P.O. Box 796, RT 3 at Cummings Hill Rd., Plymouth, NH 03264 or call (603) 536-3768.

October 10-12. Flemington, NJ
Flemington Crafts Festival at the Flemington Fairgrounds. For more information contact United Craft Enterprises, Box 326, Masonville, NY 13804 or call (607) 265-3792.

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Pittsburgh	• Oct. 23-24-25	• Pittsburgh Convention Center
Metro-Detroit	• Oct. 30-Nov. 3	• Michigan Fairgrounds-Detroit
Oregon	• Nov. 13-14-15	• Portland Memorial Coliseum
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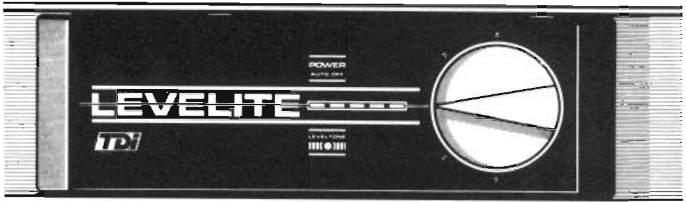

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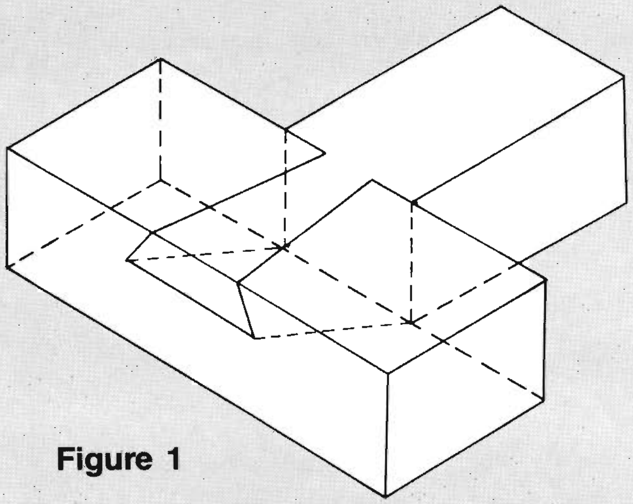
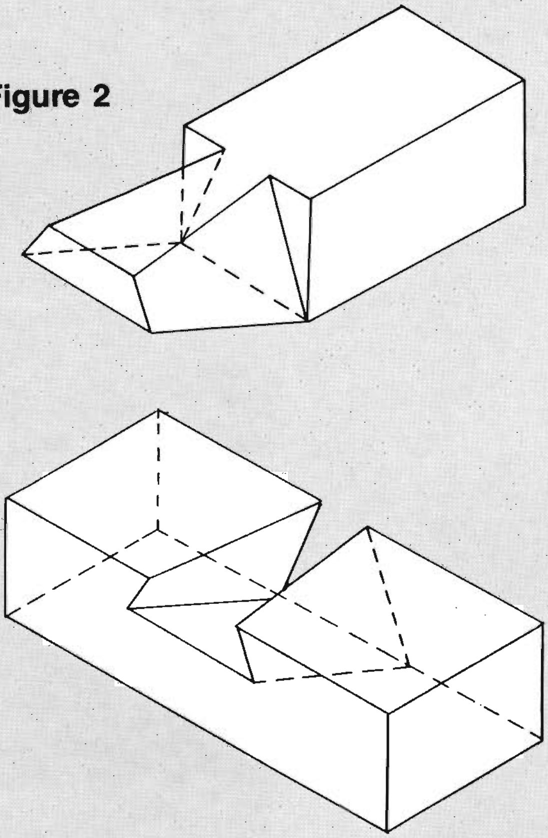


Figure 1

Figure 1 shows the hidden edges that make the double dovetail feasible. Figure 2 shows how the two pieces would look separately. The joint is possible, but it's tricky to make, and offers no real structural strength. But if you use contrasting woods and glue it together permanently, it can be a puzzling novelty.

Figure 2



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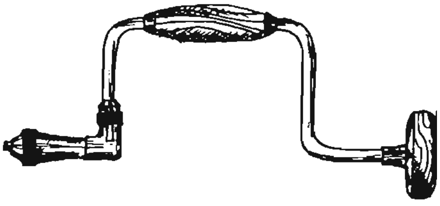

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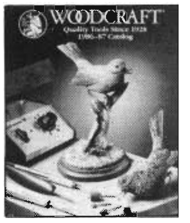

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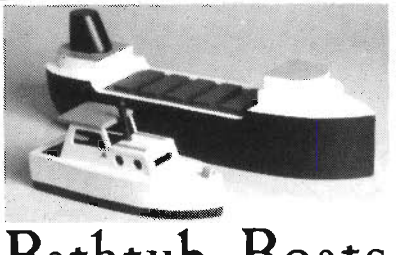

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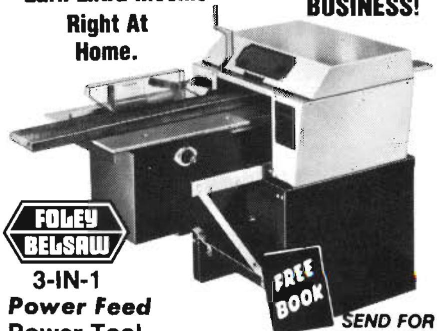

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Kinda square is like kinda pregnant or kinda dead. It's impossible: there's nothing halfway about it. Once it was a precise measurement, an absolute term. A thing — be it piece, project, board, concept, deal, whatever, either was or was not square, and if it wasn't square, it was no damn good.

Thus, like every woodbutcher I've ever known, every piece of furniture I've made is imperfect, and all my tools are grossly imprecise. Not that it has made any difference.

For most of us, square has become a relative term. Objects are more or less square. Only rarely are they perfectly square, and when that happens, it's miraculous! That's why "woodbutcher" should not be regarded as a put-down: the woodbutchers I know are more likely to build imperfect-but-awfully-fine dining room suites than crude two by four picnic tables (though the woodbutcher's picnic table might be just as desirable).

To us, square is little more than a target. In hopes of achieving it, we buy some pretty fancy squares, and learn how to test them: we check to see if the inside of each fits the other's outside, and if they come dead parallel when both are placed against a straight edge. When this rare pair is found, we buy both of them, and since square is what we're allegedly after, it is an important tool — even in a "relative" (as opposed to square) shop.

"Nice marquetry Donavan, but it's not regulation!"

We spend great sums of money trying to buy precision through better machinery, however that hasn't necessarily led to better results, but rather to a gadget-laden poorhouse. Of course, I am *still* seeking the "perfect" tool, much as a gambler bets all he has left on the next hand, hoping to recoup his losses. Witness my review of the INCA table saw in issue #34 of PW: my lusting after it is surely all in vain, for I know precision (or the lack thereof) lies in me, not in my tools. Precision isn't something that can be bought.

In a quest for something nearer perfection, some woodbutchers have striven for machinist's exactness in the shop. But since wood is not aluminum, brass, or steel, machinist's tolerances are a joke in the wood shop. Wood moves. So what if your board is sawn to within .005″? My rulers make me extrapolate to get [1/32]″, and I wonder who I am trying to kid at that. Given a few seasons of shrinking and swelling, no one will know about .005″, no one will know about 1/32″, and no one will know about perfectly square either. What they will know about is smooth, eye-pleasing fit, and easy operation of component parts...But perfection?

Perfection is for the gods, and gods we aren't, not by a long shot.

Duplicate diagonal sticks may be great for achieving square, but when the wood is less than perfect and you are working alone with a large project and human cutting tolerances, fitting, clamping, and adjusting the fit from "pretty square" to perfectly square may be an exercise in applied futillity.

It's okay for things to be relatively unsquare, but only in certain directions: drawers, for instance, should be wider at front than at back, both horizontally and vertically. Book cases or other carcase pieces are also only relatively square. If you question this, all you have to do is check out your house, or any fine commercial furniture you may have for square. That investigation will end any possible debate before it

---

***Hugh Foster** is a furnituremaker/designer in Manitowoc, Wisconsin, and a contributing editor to* PW.

begins.

In a woodbutcher's shop like mine, a cutting list is virtually useless for anything beyond preparing a shopping list of materials. There's no way most of us can cut all the pieces in a list to size and then assemble the project. That degree of precision is unachievable by people like us — and we are legion.

If I build a project a piece at a time, carefully fitting each component, I get results that are better than just satisfactory, but the project probably *won't* be square.

So don't gauge my work with a square. Instead look at it, touch it, see if its moving parts work properly. My eyes work better than my square, and if yours don't, please don't buy my furniture. I strive far too hard for square, trying against all odds to get it right. Maybe in woodworking as in living, it is the *trying* that counts. PW

Not Just Some . . .

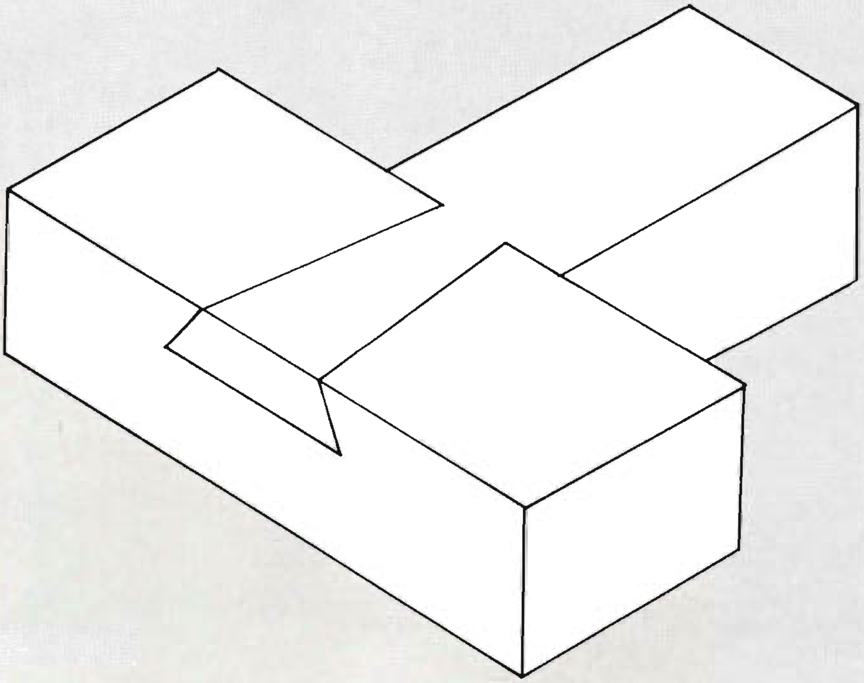
Frank Criscenti, a vocational mill and cabinet instructor associated with California's correctional system, tells of experiencing difficulty explaining to an inmate the identifying characteristics of various woods in a shipment, including some alderwood, when a second man helpfully interjected, "What Frank means is ALL DA WOOD! All da wood in dis pile, all da wood in dat pile, all da wood in da other pile!"

D. A. Stansbury

The Double Dovetail

by George Washington

Now that you're an expert dovetailer, here's a puzzle for you to try and explain. These two pieces of wood are joined together in an apparently impossible manner. Can you show how this joint is possible by drawing in the dotted lines to indicate the unseen edges of the wood? The answer is on page 57.



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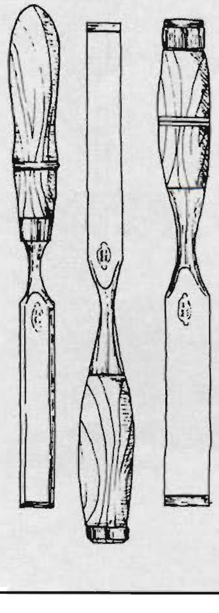

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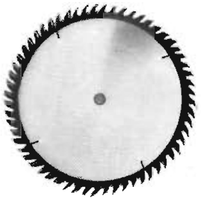

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The laser technology used by Freud eliminates the need to fill the holes, and makes the expansion slot only .003 inch wide (about the thickness of a human hair). This assures the tensioning strength, a quieter running blade and no danger of the plugs coming out while in use.

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Freud produces carbide in their own factory. This assures the high quality level that cannot be obtained by saw blade manufacturers who buy carbide from outside sources.

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The carbide is induction brazed onto Freud's laser cut blade shoulders. This process is controlled by a computer system that assures uniformity of brazing. The hand brazing used by other manufacturers can result in weakened shoulders (due to over heating) and inconsistent bonding.

The blade is finally sharpened with a 400 grit diamond wheel for a razor edge and a mirror finish. Because of the cost of such a fine grinding wheel, many other blade producers use a coarser grade of diamond wheel. This can result in shorter blade life for you.

By comparing the Freud advantages, you will find the value and quality you want in your tools.

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With the purchase of these 3 blades, you will not need to buy any other blades! You have a blade that gives you a glue line rip finish in the LM72M010. Another blade, the LU85M010, cuts with a "glass like" finish when cross cutting or mitering. The third blade, LU84M011, is your combination blade that is used when an extreme cross cut finish or production rate ripping is not needed.

		List	Sale
Set of 3 Blades		$272.77	$159.50
LM72M010	10 x 24 Flat	70.69	48.25
LU84M011	10 x 50 Comb	81.22	49.75
LU85M010	10 x 80 ATB	120.86	81.50

DADO

Freud Carbide Tipped Dado Heads produce a smooth and accurate groove when used running with the grain or across the grain. The standard dado cuts a maximum width of 13/16 inch. All blades and chippers are carbide tipped and sharpened to give you a long cutting life. The set contains 2 outside blades of ⅛" kerf, one 1/16" chipper, two ⅛" chippers and one ¼" chipper.

		List	Sale
DS306	6" x 18 Dado Set	$160.12	$125.00
DS308	8" x 18 Dado Set	$196.09	$135.00

94-100

Produce your own cabinet doors with this 5-piece router bit set at a fraction of the cost of shaper heads!!

These bits are individually balanced and designed to be used with a ½" table mounted router.

The bit profiles are: rail and stile , raised panel , door lip , and glue joint . All bits are precision sharpened for a long cutting life.

		List	Sale
94-100	5 Piece Router Door	$248.00	$199.00

EC-900

Produce professional quality cabinet doors with this 5 piece set of cutter heads designed for your ¾" - ½" spindle shaper. These heads are sharpened with a 600 grit diamond wheel for an extremely sharp edge. One half inch bushings standard.

The shaper head profiles are: Rail & Stile , raised panel door lip , and glue joint .

		List	Sale
EC-900	5 piece Shaper Set	$489.91	$380.00

90-100

This 15 piece router bit set offers you a great variety of useful bits from "V" grooving and flush trimming to chamfering and dovetailing. All bits are solid carbide or carbide tipped and are ground to a razor sharp edge. Profile bits have a shear face for an extremely smooth finish.

All bits have a ¼" shank.

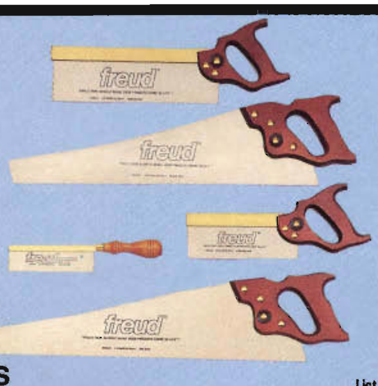
		List	Sale
90-100	15 pc. Router Bit set	$249.61	$199.00

FB-100

These Forstner bits will produce a flat bottom hole and bore any arc of a circle at any angle thus allowing you to make pocket holes. A special heat treated steel is used in their production to assure long lasting edges.

The 16 piece set includes bits from ¼" to 2⅛" inclusive in ⅛" increments.

		List	Sale
FB-100	16 pc. Forstner Bit set	$249.00	$199.00



HAND SAWS

These hand saws are made in Sheffield, England out of their finest steel to give you high performance and durability. These high quality blades are flexible but will always return to true.

The collection of 5 saws (rip, panel, tenon, dovetail, gent's) will meet all of your hand saw needs. They are precision balanced, thus letting the saw work with you. The lacquered English red beech handles are designed to make your precision sawing comfortable.

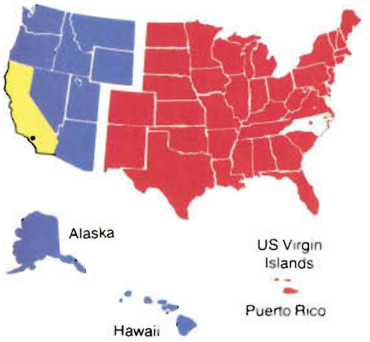
		List	Sale
Set of 5 Hand Saws		$102.51	73.50
RS024	24" x 7 points	22.21	16.50
PS022	22" x 10 points	20.93	18.25
TS012	12" x 15 points	26.71	21.25
DS008	8" x 20 points	23.46	19.25
GS006	6" x 15 points	9.20	8.25

DB-050

This 50 piece set consists of: A) 25 high speed steel bits (1/16" - ½" in 1/64" increments) B) 4 high speed steel bits for sheet metal (¼, 3/16, ⅛, 3/32) C) 6 chrome vanadium steel brad point bits for use in wood (⅛, 5/32, 3/16, ¼, 5/16, ⅜) D) 6 carbide tipped masonry bits with hex shanks (5/32, 3/16, 7/32, ¼, 5/16, ⅜) E) 1 center punch, 1 Allen key and 6 depth stops.

These bits fit any stationary or portable drill using ⅜" or larger chuck.

		List	Sale
DB-050	50 Piece Drill Bit Set	$89.00	$69.00



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